



needles *in medical history*

H.AT



The Wellcome Trust



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you won't feel a thing

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An exhibition at the Wellcome Trust History of Medicine Gallery April 1998

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H.A.T.



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Preface

The idea of doing an exhibition about Edward Jenner and vaccination has been in currency for a good while. Two years ago, when the bicentenary of Jenner's first vaccination of eight-year-old James Phipps on 14 May 1796 was being celebrated, a decision was taken not to push forward with plans for this exhibition. Instead, we decided to wait two years for another bicentenary, this time of the publication of Edward Jenner's famous work announcing his discovery: *An Inquiry into the Causes and Effects of the Variolae Vaccinae*.

The delay has been beneficial, for it has allowed the exhibition idea to mature and expand. Jenner's extraordinarily significant work and his announcement of it still forms the starting point for the exhibition. From there our theme has grown first to include a broader history of smallpox, which now embraces earlier work on the disease and various non-Western attempts to deal with it, through to its official eradication in 1980. The next expansion was to look at the history of vaccinations developed for other diseases – rabies, diphtheria, cholera, typhoid, polio and so forth. By now, the centre of gravity of the exhibition was shifting, with the original interest in vaccines being replaced by another in the equipment used to deliver them. It was at this stage that the true theme of the exhibition emerged – the potency of the needle in the form of a hypodermic syringe as a symbol for the whole of medicine. From here our research took us into investigations of anaesthetics, blood transfusion, diabetes and insulin, lethal injections, recreational drugs, and also into the popular visual culture that has emerged alongside all of these medical applications of this extremely useful piece of technology. Finally, two other medical applications of needles suggested themselves as worthy of inclusion. One was their application in a Far Eastern therapy that was indeed defined by them: acupuncture. And the other was the use of needles in the surgical art of suturing wounds.

Some might object that this exhibition has become little more than a ragbag of medical themes only loosely and haphazardly sheltering under the technological similarities of their core equipment. Were this an argument presented in a monograph, such potential criticisms might well be justified. But exhibitions work differently, and 'You Won't Feel a Thing' holds fast to a sound museological principle, that of exploring (albeit with considerable lateral expansion) a single piece of material culture – namely the medical needle. This exhibition should thus be taken as an experiment in identifying a chief character – the hypodermic syringe that fills the medical phobic's worst nightmare – and then following it into a variety of scenes in which, at times, the character itself does not appear. It is up to our visitors and readers to decide whether the experiment has worked.

Ken Arnold

The Wellcome Trust

The Wellcome Trust is an independent medical research charity spending some £250 million on research every year. The Trust supports more than 3000 researchers, at 300 locations, in 30 different countries – laying the foundations for the healthcare advances of the next century and helping to maintain the UK's reputation as one of the world's leading scientific nations.

The Trust also funds major initiatives in the public understanding of science and is the country's leading supporter of research into the history of medicine. Part of its work in both these areas is focused on two separate galleries. The Two10 Gallery presents a series of exhibitions that explore the overlap between contemporary art and medical science; while, drawing primarily on the riches of the remarkable collections of Sir Henry Wellcome, the History of Medicine Gallery shows exhibitions relating to various aspects of the subject.

History of Medicine Gallery

The present exhibition is the most recent show presented in the History of Medicine Gallery. This series of exhibitions provides windows on to the remarkable collections held by the Wellcome Trust. For reasons of conservation and security the material displayed in them is not usually on public view, but can be consulted by Library readers. The last lines of the exhibit captions reproduced here give details of where items come from – that is the catalogue numbers and collection areas: Contemporary Medical Archives Centre (CMAC), Early Printed Books (EPB), Historical Collection, Iconographic Collections, Modern Medicine Collection, Oriental Manuscripts and Printed Books, and Western Manuscripts (WMS). These exhibitions often also include objects from the Wellcome collections kept at the Science Museum (which can also be consulted by prior appointment), as well as relevant exhibits loaned by other institutions and individuals.

Approximately two history of medicine exhibitions are mounted each year, the themes of which often reflect research undertaken within the Academic Unit of the Wellcome Institute for the History of Medicine. It is also intended that they might suggest ideas for further research.

Past exhibitions have included 'Picturing the Body: Five centuries of medical images' (1993) – an examination of the evolution of medical attempts visually to understand the human body and its workings; 'Birth and Breeding: The politics of reproduction in modern Britain' (1993/94) – an exploration of some of the debates surrounding motherhood in the twentieth century, with material selected from six archives housed in the Contemporary Medical Archives Centre in the Wellcome Trust Library; 'Fatal Attractions: AIDS and syphilis from medical, public and personal perspectives' (1995) – a comparative look at the histories of two diseases that have had such enormous impacts on world history; 'Abracadabra: The magic of medicine' (1996) – an exhibition about the interwoven histories of magic and medicine; 'Doctor Death: Medicine at the end of life' (1997) – an exploration of the history of death in its medical context; and, most recently, 'Saving Bodies, Saving Souls: Hospitals in history', which traced the history of what has become the central institution in modern medicine.

Part 1

Where the Statue Stood: The reputation of Edward Jenner

Over the last two centuries vaccines have proved the most potent weapons against disease. Smallpox has been eradicated worldwide – its official disappearance in 1980 signalled, according to the World Health Organization, an “unprecedented event in human history; the deliberate worldwide eradication of an important human disease”. Health authorities now look forward to the final conquest of other lethal diseases through vaccines – polio and measles for instance – while with others, like malaria or AIDS, our best hopes may lie in that direction.

And so it would be natural to look back, with an assured judgement, on Edward Jenner’s pioneering of smallpox vaccination. “In my opinion”, declared his contemporary, Dr Matthew Baillie, “it is the most important discovery ever made in medicine”. James Sims, President of the Medical Society of London, concurred: vaccination was the “greatest and most useful discovery ever made in medicine”, and “Dr Jenner, had he kept it a secret might have died the richest man in these dominions”.

Jenner’s life can plausibly be presented as one of the finest chapters in the history of medicine – indeed, the stuff of legends: a man of modest provincial origins and great humility achieving more than all the colleges and corporations. Simply put, it runs thus: the son of a Gloucestershire clergyman, Jenner was orphaned at the age of five and looked after by his elder brother, and developed a taste for country pursuits, particularly natural history. In 1761 he was apprenticed to a surgeon in Sodbury. In 1770, he went up to London and became a pupil of the illustrious John Hunter, whose influence and patronage proved crucial for, as well as teaching him surgery and anatomy, he encouraged the systematic pursuit of natural history.

Like most contemporary English country practitioners, Jenner routinely inoculated for smallpox. This involved taking some material from the pustule of someone suffering from smallpox and introducing it beneath the skin of another who had not yet had the disease. They would then contract the disease, but the induced attack conferred lasting immunity. The experience also proved that smallpox acquired by inoculation was generally far less severe than when contracted naturally. In times when the vast majority of the population would sooner or later contract the disease, inoculation made good sense, even though the inoculated person was infectious for some weeks.

Inoculation was introduced into Britain early in the eighteenth century by Lady Mary Wortley Montagu, who learnt the practice from women in Turkey. It was only patchily employed until the 1760s, but then Robert Sutton and his son Daniel, humble surgeons from Suffolk, made it popular by devising an easy, safe and cheap technique, involving

application of a small quantity of material to a scratch on the arm. They bulk-inoculated whole villages at a time, up to 500 people a day, to minimize risks of accidental spread of the infection to uninoculated parties.

Jenner too was an inoculator. In his native Gloucestershire, however, it was also known that there was a cattle disease, cowpox, occasionally contracted by human beings, particularly dairy maids. Producing mild fever and a few pustules, it was a benign, self-limited disorder, and, before the subject attracted Jenner's attention, folk knowledge recognized that it conferred immunity from smallpox – indeed various farmers used cowpox instead of smallpox for inoculation.

By 1780, Jenner shared the popular wisdom about the protective value of cowpox; he thought it might be possible to confer this immunity directly by arm-to-arm inoculation from the cowpox pustule, by analogy with smallpox inoculation. In 1796 a cowpox outbreak in a nearby herd gave him the opportunity to test his ideas out. On 14 May 1796 he inoculated James Phipps, an eight-year-old boy who had never had smallpox, with some matter taken from the cowpox pustule of a dairy maid, Sarah Nelmes. Phipps developed a pustule and a slight fever from which he quickly recovered. Six weeks later Jenner inoculated him with smallpox 'virus', as the inoculation material was called. It did not take. Evidently cowpox conferred immunity against smallpox.

In June 1798, Jenner published his findings, at his own expense, in *An Inquiry into the Causes and Effects of the Variolae Vaccinae*. A 75-page work dedicated to his friend Caleb Parry, it described the original inoculation of Phipps and other instances, including that of his own son. His conclusion was confident:

“But as I have never known fatal effects arise from the cow-pox...; and as it clearly appears that this disease leaves the constitution in a state of perfect security from the infection of the small-pox, may we not infer that a mode of Inoculation may be introduced preferable to that at present adopted?”

Jenner's publication attracted instant attention, running to a third edition by 1801, an American edition in 1802, and seven translations by 1803. Henceforth, Jenner's life was totally bound up with 'vaccination', as the practice became called. By 1799 over 5000 people in Britain had been vaccinated, many at the London Smallpox Hospital, though an early batch of the cowpox 'lymph' was contaminated with smallpox and some of the vaccinees subsequently developed smallpox. Vaccination was taken up swiftly and met little initial opposition; and Jenner won fame – wealth even. Parliament

granted him a total of £30 000 as a reward for his vaccination activity.

Meanwhile in 1803 the Royal Jennerian Society was founded as a charitable organization to conduct free vaccination of the poor from premises in Salisbury Square. By 1808 a national vaccine programme had been launched. And though at war with Britain, Napoleon himself struck a medal in Jenner's honour, making vaccination obligatory in the French army. William Wilberforce, the abolitionist MP, was soon to note that there was "no man who is so much inquired after, by Foreigners, when they arrive in this country". Jenner became internationally acclaimed as a saviour: "It would be my fate to be Vaccine Clerk to the World", Jenner confided to Henry Addington, then Prime Minister.

Yet this tale of triumph is not the complete story. Both during Jenner's lifetime and subsequently things were more complex and contested than that. Back in 1973, the 150th anniversary of his death, E Ashworth Underwood correctly remarked that "no man has suffered more than Jenner from the excessive eulogy of his friends or from the invective of those who did not subscribe to his views". For one thing, the Royal Society declined to publish his first vaccination manuscript. "To say that the reception it received was apathetic would be an understatement", writes the historian Paul Saunders, who is led to comment in the light of this and other developments: "Never, perhaps, has a major advance in medicine had such rough passage to acceptance" – undoubtedly a gross exaggeration, but one which at least has the merit of drawing attention to certain enigmas in Jenner's career.

Jenner certainly had his doubters and detractors. Some liked to point out that his so-called 'discovery' was no such thing at all, since the usefulness of cowpox had long been known about. Moreover, the nature of the immunity conferred by cowpox was called into question early, since cases began to crop up of vaccinated individuals acquiring 'natural' smallpox months or years later, whereas inoculation standardly protected for life. All this encouraged charges that he was a quack, a fraud or a danger. Particular incidents threw vaccination into doubt and compromised Jenner's reputation, as he and the Jennerian Society became embroiled in embarrassing revelations of alleged failures.

So fierce were certain charges, or so thin was Jenner's skin, that for all the adulation and rewards, he increasingly looked upon himself as a martyr and grew despondent. Sometimes his complaint was that, despite everything, his great discovery had left him out of pocket. Sometimes he professed indifference to wealth but alleged that what he lacked was honour. And he began to draw telling comparisons in his notebooks with the fate of Sir Isaac Newton:

"he was so little & desirous of glory from any of his works, that he, as it is

well known, would have let others run away with the glory of those inventions...if his friends and countrymen had not been more jealous than he, of his and their glory.”

Clearly he felt wounded, and believed his countrymen ought to have accorded greater recognition of both his claims and the rewards they deserved.

Criticism of vaccination and of Jenner himself simmered after his death and finally came to the boil. There was persistent disquiet from the 1820s about the risks consequent upon shoddy vaccination techniques. These criticisms gave credence to those who rejected vaccination altogether. Amongst the most distinguished later anti-vaccinationists was Charles Creighton who grounded his rejection on an anti-contagionist disease theory, which held that vaccination entailed a poisoning of the blood. Creighton was also a fierce debunker of Jenner as a person. His *Jenner and Vaccination: A strange chapter of medical history* (1889) contended that he had acted fraudulently, characterizing him as little better than a money-grabber.

Anti-vaccinationist opinion and agitation intensified from the passing of the Vaccination Act of 1853, which made vaccination obligatory. A succession of journals appeared, beginning with Henry Pitman's *Anti-Vaccinator* in 1869. In 1874 the National Anti-Compulsory Vaccination League was founded, while William Tebb established the *Vaccination Inquirer* in 1879, a year before he founded the London Society for the Abolition of Compulsory Vaccination. A key anti-vaccination text was written by the first editor of the *Vaccination Inquirer*, William White. Drawing upon all the standard doctrines used by anti-vaccinators, White began with a critical history of inoculation and vaccination, and the vaccination laws, and then proceeded to the by-then familiar scathing attack on Jenner and his supporters. Greed, he believed, was the motive of both the inoculators and the vaccinators, and that was the evil genius of Jenner himself.

Anti-vaccinationism thrived as a political protest over the powers of the state to require vaccination, established by the Act of 1853. Compulsory vaccination sparked civil disobedience. The most notable events took place at Keighley, resulting in the imprisonment of recalcitrant Poor Law Guardians inspired by the ‘martyrdom’ tactics advocated by the Rev. William Hume-Rothery and his wife Mary, the founders of the National Anti-Compulsory Vaccination League.

The anti-vaccinationists’ campaign took a further step forward in 1880, when William Tebb established the London Society for the Abolition of Compulsory Vaccination (later

the National Anti-Vaccination league), which provided the focus of activity during the 1880s and early 1890s in lobbying parliamentary support, and which had its moment of glory in 1909 when Parliament rescinded compulsory vaccination.

Parallel to these grassroots protests and opposition from different medical viewpoints, one may discern a lasting ambiguity towards Jenner – and more widely towards the medical profession – among the political establishment. This surfaced most conspicuously in the great statue controversy. As early as March 1823, when the House of Commons was voting on the annual grant for the National Vaccine Establishment, an unsuccessful attempt was made to secure public funds for a Jenner monument. Further agitation for a statue arose in 1851.

At the Great Exhibition, the sculptor, William Calder Marshall, displayed a model for a Jenner statue; this induced a number of medical men to form a committee to raise funds for its casting. As the money trickled in, the question arose of where in London it should be erected. In 1857 a London Bridge position was being considered, and then the idea of a still more illustrious siting in the new Trafalgar Square was floated. By August of that year, the Queen had granted her permission for siting the statue there, and plans were laid for the inauguration. A formal ceremony was held in the hall of the Royal College of Physicians, then in Pall Mall East, on the corner of Trafalgar Square, on 17 May 1858, the anniversary of Jenner's death.

Yet, far from immortalizing Jenner the statue immediately became the centre of controversy. The MP Thomas Duncombe attacked it in the Commons; according to *Hansard*:

“He [Mr Duncombe] did not mean to say that a statue of Jenner was not a very good thing in its proper place, but he thought it altogether out of place among statues of our naval and military heroes. He hoped...that some independent Member would move an Address to the Crown for the removal of this promulgator of cow-pock nonsense from its position in Trafalgar Square.”

Despite arguments in both directions, the following sorry paragraph appeared in the ‘news’ section of the 15 February 1862 issue of the *British Medical Journal*, under the headline “REMOVAL OF THE STATUE OF DR JENNER”:

“During the last few days the public have been surprised, on visiting Kensington Gardens, to find the statue of Dr Jenner, of smallpox-vaccination celebrity standing, or rather sitting down, with its usual air of placidity,

on a brand new pedestal in Kensington Gardens...The statue, it will be remembered, was some time ago promoted to a distinguished place near the Nelson Column in Trafalgar Square; but it has been suddenly removed to its present position in Hyde Park.”

And in 1897 the anti-vaccination journal, *The Vaccination Inquirer*, printed an article crowing over the feeble and abortive attempts to commemorate Jenner since his death:

“What is called the Centenary of Vaccination, the 14th of May, 1896, was not celebrated in this country – a somewhat remarkable omission considering how ready we are to celebrate the centenaries of everybody and everything.”

The substance of this observation is borne out by the final instance I wish to discuss, the dispute about the Jenner Institute. It surrounds the removal in 1896 of the British Institute for Preventive Medicine from Bloomsbury to a new location in Chelsea. Incited by anti-vivisectionists, a petition carrying 8000 signatures of local residents was sent to the Home Secretary, asking him not to permit the transfer of the licence for animal experiments to the new Chelsea building. He took no action. Two years later, a petition signed by 183 607 of ‘the people of Chelsea’ repeated the request.

Faced with such massive public disquiet or hostility, the Institute’s Governors thought a change of name might be tactful. Meanwhile, the Board of Governors of St George’s Hospital set about commemorating the centenary of Jenner’s first vaccination by raising money for ‘a worthy memorial’. But, Jenner’s name no longer held any appeal for the British public, and two years later the fund closed, having raised some £5770 of the £100 000 target, to which the public contributed a meagre £70. In spite of the paltriness of the sum, a new name ‘The Jenner Institute of Preventive Medicine’ was adopted in 1898. But a further messy entanglement with a shabby commercial practice operating under the name ‘The Jenner Institute for Calf Lymph’ meant that the name was changed again in 1903 to ‘The Lister Institute of Preventive Medicine’.

Jenner’s name no longer graces an institute. His statue still stands; but his Cheltenham house was knocked down by developers in 1969. And what of his reputation? One may of course conclude from all this that it is a story about a neglected hero and an ungrateful nation. But this would be a mistake. It is a story that brings out the deep-lying ambiguities of medicine and attitudes towards medical innovation.

Roy Porter

Part II

At the Sharp End

Needles! What does that word conjure up in your mind? Standing in a nervous queue outside the school nurse's office, sleeve rolled up, while pale classmates pass you, clutching their arms with tales of a hypodermic six inches long? Holding your sweet, innocent, screaming infant, wondering if MMR was such a good idea? Or wishing you had booked two weeks in Devon rather than a fortnight in Darkest Peru as the practice nurse draws up a tray full of immunizations?

Not surprisingly, no-one likes the idea of being injected. But for me, and about 300 000 other people in the UK, daily injections have to become part of our routine. The reason? We have type 1 diabetes and require injected insulin just to stay alive. In fact I give myself four injections every day of the year – bank holidays, birthday and Christmas included. I've done that now for about six years and, unless there is a breakthrough in medical science, will continue to do so for the rest of my life.

For most people injections are what diabetes is all about. In fact 80 per cent of people with the condition do not require insulin injections at all and can control their blood glucose levels with a balanced diet and tablet therapy. But for people with type 1 diabetes, the body stops producing any of its own natural insulin so it has to be replaced. Because insulin is a protein-based hormone it cannot be taken orally. It would be broken down in the stomach long before it could enter the blood stream. The only current answer, therefore, is direct replacement by injection.

That does not mean that scientists are not trying to overcome this problem. Research is currently being carried out on insulin patches, inhalers, specially coated tablets and protected cell implants – but all of these have their own inherent difficulties which have yet to be overcome. The main problem is accuracy of dosage. My insulin requirements change daily, depending on what I eat or how much activity I do and none of these methods can yet deliver exactly the right amount of insulin in a controlled way. However, millions of people around the world are waiting with bated breath for the breakthrough that will finally put the cap back on the syringe.

Insulin and needles have come a long way in the 75 years since insulin was discovered. With the use of additives and chemical engineering, insulin can be manipulated to work in a variety of ways, providing us with an array of insulins to suit our lifestyles. Most commonly used is a mixed insulin, which allows the individual to take only two injections a day. It might seem perverse, especially to those with a needle phobia, but I choose to inject four times a day. I suppose that is a reflection both of my need for the greater flexibility this regimen offers me and of the fact that these injections really do not hurt.

Let's go back to the injections you might remember. Most of them need to penetrate into a muscle. The needles have to be quite long and strong to do this. Insulin, however, only needs to be injected just under the skin, so the needles can be finer and shorter. The needles I use are only 8 mm long and 0.3 mm thick. That is why, 95 per cent of the time, the injections really don't hurt.

In fact, having taught people about injections, the biggest factor preventing them from taking the plunger in hand is fear. You can see them trying to build up their courage as the needle hovers over the surface of the skin. Some people never overcome this but those who do are often amazed that they have actually injected themselves. "Is it in?" they ask nervously, not daring to look down. One person, so pleased at having overcome their fear and so amazed at the painlessness of it all then proceeded to jab themselves repeatedly – until advised to stop: fine needles have a limited life span.

Of course, this is the experience of the 1990s. When insulin was first widely used, things were not so comfortable or easy. In a small volume from Australia, entitled *So I'm A Diabetic*, care of syringe and needle are discussed in some depth. This includes dismantling new syringes and boiling them for five minutes before first use; storing syringes and needles in methylated spirit and sharpening needles – the very idea sets my teeth on edge. This should be done by "gentle rubbing, bevel downwards, on very fine emery paper and then against a razor stone or fine oil-stone". Fortunately, life for the modern diabetic is a lot easier.

One of the inventions of recent years is the pen-injector. Like an ink cartridge pen, this holds a small vial of insulin which is 'drawn up' by dialling the required dose and is instantly ready for injecting. So easy is this to use that I have given myself discreet and unnoticed injections on the bus, in the street and while queuing for an ice-cream (but don't tell my dietician that). A far remove from resharpened needles and soaking syringes. There is only one problem with this method of injecting. Unlike the traditional syringe, which is free on prescription for people with diabetes, the needles for pens have to be paid for. It seems a great shame that a device which has helped so many people with diabetes cannot be provided free of charge.

So what is life like on the receiving end of four jabs a day? When I was first diagnosed I was fairly lucky. Having been working as a nurse for five years I was quite familiar with syringes, needles and injection technique. However, I had generally been on the blunt end of any injection and it did take some time to get used to rolling up my sleeve and being both nurse and patient. Friends and family, however, were less well informed.

On my first visit to my parents after diagnosis my mother was most distraught. Apart from asking me repeatedly if I could eat anything she placed in front of me, she went rather pale when I got ready to inject. Determined to 'share in my suffering' she sat nervously watching as I rolled up my sleeve and drew up my insulin. Within seconds the needle was in and out, and the show was all over. My mother looked most disappointed. "But don't you have to get it into a vein?" she asked.

I suppose that view of injections comes from police dramas and films like *Trainspotting*. The desperate junkie ties a tourniquet around his arm, taps a vein and then sinks an inch-long needle beneath the skin. Insulin injections are incredibly dull compared with this. You don't even really need to look to see where you're injecting and you can use virtually any part of the anatomy – though arms, legs, buttocks and stomach are usually recommended.

The feeling of being a junkie, though, does occur. When I was first injecting, especially in a public place, I would go and lock myself in the toilets, praying that no-one would burst in and catch me flicking air bubbles out of a syringe. The very act of 'shooting up' sometimes made me feel very guilty, mainly because I felt it had to be hidden from public view. The same was true when my bag would pass through an airport security scanner, and I was convinced that some stony faced customs officer would turn to me and say "Just one moment sir, what have we here?". In truth, the only time this ever happened, the officer was only concerned about my personal stereo and ignored the syringes completely. (Having said that, I always carry an insulin user's ID card when travelling, just in case Bangkok security officers are less easy-going.)

I think one of the reasons this guilt feeling persists for people with diabetes is that we're a relatively rare bunch. Most big secondary schools will only have one or two children with diabetes and there is often a feeling of being alone with the condition. One of my best memories of recent years was attending a conference of young people with diabetes, organized by the British Diabetic Association. Apart from the fact that everyone told similar tales of not sticking rigidly to the rules, while propping up the hotel bar, it was wonderful to be with other people who lived life with diabetes. Embarrassment about injecting soon disappeared when, at dinner, about 100 other people got out their syringes and pens and injected before the meal. I was not alone – though the hotel staff looked a little taken aback.

You might have noticed that I said 95 per cent of injections are painless. Some hurt like mad, normally a sharp, stinging pain. But this only lasts for a few seconds in my experience and, well, I haven't got much choice. If I refused to inject, I could become seriously ill in

a matter of days. An occasional sting is far better than days in intensive care with rocketing blood glucose levels. A more common problem with injections is the occasional bruise or, if repeatedly injecting in the same spot, some localized swelling. Such problems can often be overcome by learning good technique and taking care to change the injection sites on a regular basis.

Another reason for injections to be painful is if you overuse the needle. Nowadays needles are not designed to be resharpened and are safely discarded after use. Many people, however, will use a needle more than once – often four or five times – before changing them. Overused needles become blunt and lose their lubricating coat, making them uncomfortable and increasing the risk of them breaking. Once, when on holiday, I had my syringes and pen needles stolen and was reduced to reusing a needle far more than I would have liked. It is not an experience I would wish to repeat as each injection became more uncomfortable and psychologically harder to carry out. I have never been so overjoyed as when I was able to visit a chemist and purchase some new supplies.

Of course, no-one is perfect. Some days, I must admit, one of my jabs goes out of the window. Normally on a Sunday morning, when the idea of crawling out of bed and eating breakfast are too much for anyone to bear. Well, I'm only human and I live with my diabetes, I don't let it control my life totally. Provided I treat it with the respect any life-threatening chronic condition deserves, I can give myself some flexibility – not to mention the odd bar of chocolate. But, on the whole, needles and injections have become as much a part of my daily routine as washing up or going to work. It's a chore but it has to be done and no-one else is going to do it for me.

From all of this you probably get the impression that diabetes is a piece of cake – albeit a rather thin slice. That doesn't mean that having the condition is something I'm happy about. Like all of you I would love to eat what I like, when I like; do what I want, when I want. With diabetes your life has to be planned and prepared for. And there is always the dark shadow of the frightening complications lurking somewhere in the back of your mind. But at least, for me, the injections are largely just a part of the routine. It would be great not to need needles but for those of us with diabetes, we're very grateful that they are there.

Simon O'Neill BA(Hons), RGN, RSCN
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British Diabetic Association

Part III

You Won't Feel a Thing: The exhibition

It has been estimated that most of us spend about 20 minutes of our lives with needles under our skin, receiving a hundred injections. Put another way, however, this statistic reveals that we barely have more than one injection a year. And yet, ask people what in medicine they most fear, and chances are many will say the hypodermic syringe. Why is this object, and particularly the sharp end of it, such a potent and ubiquitous icon for our fear of medicine? For one thing, humans long ago evolved into creatures whose blood pressure dropped in anticipation of their skin being punctured, so that they would not lose too much blood when it happened. This is part of the reason that many people faint at the sight of a hypodermic needle. An injection does, undeniably, involve some pain and a small injury; but this is not the whole story.

The fear of needles is also to do with bodily intrusion and internal violation, for in being injected patients seemingly allow entry to a vampiric technology capable of contaminating them from within. And beneath its immediate appearances, there is also the suggestion that the medical needle is really something more sinister in disguise: an arrow, knife, stake, fang, gun, bird's beak, or fork maybe.

But there is also, seemingly, a psychological fascination with medical needles: with the juxtaposition of hard and soft (metal against skin), and with the sexual overtones of the injector's art of penetration and ejaculation. And, of course, patients receiving injections by and large 'know' that the pain relief, medicine, or vaccines they are receiving are meant to be good for them, even if the delivery system is fearful.

The tale of the medical needle then is a complicated, double-edged, or maybe double-ended one, wrapped up with both the hopes of great human benefits and the worries and fears of deep-seated problems and traumas. The image of the hypodermic syringe as a magic wand set to wipe out diseases and evaporate pain therefore stands alongside another in which it is a gun pointed at society's head, loaded with the bullets of AIDS and drug addiction. It is this piece of remarkable medical technology and the ideas that surround it that forms the core of this exhibition.

In 1798, more than half a century before the invention of the hypodermic syringe, Edward Jenner published his discovery of smallpox vaccination. The bicentenary of that publication provides the point of departure for this broad thematic exhibition, which, through six sections, takes an eclectic look at the role of needles in medicine (not just those used with hypodermic syringes, but also those employed in suturing and acupuncture), and at their psychological and cultural contexts.

Section 1 looks in turn at the early history of inoculation derived from non-Western medical traditions; at Edward Jenner's development of smallpox vaccination; and at the fashion in which Jenner and his discovery were turned into a medical legend of international proportions.

Section 2 examines the controversy surrounding smallpox vaccination (the satirical attacks and political defences of both the practice itself and the laws governing its use) and the subsequent history of smallpox up until its official global eradication in 1980.

Section 3 deals with the evolution of vaccination as a more general tool in nineteenth- and twentieth-century medicine, focusing on the development of vaccines for such diseases as rabies, polio, cholera and diphtheria.

Section 4 charts the increasing use of needles as a means of delivery for various medical substances: in pain relief, nutrition, medicines, blood and so on. It also presents material from the broader cultural (including 'counter-cultural') contexts that illuminate the prominent role of needles as an icon for medicine, but also drug use, euthanasia, execution and tattooing.

Section 5 is about needles in a completely different medical and cultural context, namely acupuncture. Exhibits here reflect both its ancient Eastern roots and its contemporary use around the world.

And finally, **section 6** is concerned with the role of needles in suturing – that is the long history of sewing human tissue through to the recent development of glues which might, for certain purposes, replace needles and thread.

Introductory exhibits

Public health campaign posters

Many of the needle-related medical innovations of the past 100 years (from new vaccines, to the development of blood banks relying on blood donation, to the drive against needle sharing by drug users) have relied on the dissemination of public information, in which the use of posters has been a constant tool. The following small selection of posters, and others presented in the rest of the exhibition, reflect a range of such campaigns.

A.1 Poster showing the head of a laughing baby, threatened by a dangerous shadowy hand representing diphtheria. Colour lithograph after Reginald Mount. The legend reads “Diphtheria is deadly. Protect your child by immunization. Ask at your local council offices, school or welfare centre.”

Iconographic Collections – cat. no. 22657

A.2 Poster of a girl walking with crutches and leg-braces in the shadow of polio. Colour lithograph after Reginald Mount. [Illustrated]

The legend reads “Polio. If you are not already protected see your doctor or clinic now.”

Iconographic Collections – cat. no. 22659

A.3 Poster with the word ‘polio’. Colour lithograph after Eileen Evans.

The legend reads “Polio can cripple even the fittest. Vaccination is available free to all up to age 40. Ask your local health department, clinic or family doctor for details.”

Iconographic Collections – cat. no. 22658

A.4 ‘30 minutes of your time, a lifetime to somebody else: blood donors now’. Blood donation campaign poster by Abram Games. 1951

CMAC – GC/107/1

Film clips

Most of us prefer not to watch when it comes to having a jab, even if someone else is the ‘victim’. There is something about the sharpness of the needle and the puncturing of the skin that invariably induces a shudder. It is this reaction and the desire to look away which make injections such a compelling subject in film.

This compilation portrays the use of the needle in a variety of contexts. The *Trainspotting* camera treats it sensuously, lingering over a syringe full of heroin, whilst in the clip from *Coping with Diabetes* we see a more practical viewpoint. In the early campaign film for diphtheria vaccination, a girl beams into the camera, having us believe that she is delighted with the injection she is receiving. But, be warned, these clips are not for the squeamish.

In addition to these clips, the exhibition also presents in its entirety the short documentary *Small Objects of Desire – The Syringe* (1993) – an imaginative portrait of the uses and abuses of the syringe (courtesy of BBC Worldwide Ltd).

Film 1

Surprise Attack. 1951

(Central Office of Information)

A dramatized tale of an outbreak of smallpox. Part of the Ministry of Health's campaign to ensure that all babies were vaccinated.

Film 2

The Last Wild Virus. 1984

(Courtesy of Southern Star Sales)

A documentary which recalls the work involved in the eradication of smallpox. In Bangladesh, where the final struggle against the virus was focused, locally recruited workers are trained in how to administer the vaccine.

Film 3

Have You Had Your Children Immunised Against Diphtheria? 1942

(National Film and Television Archive)

An official government film which warns parents of the danger of diphtheria and urges them to have their children immunized against it.

Film 4

Not so Much a Training, More a Way of Life. 1967

(The Royal London Hospital. Royal Hospitals NHS Trust)

A piece of cinema verité aimed at encouraging women to join the nursing profession. Student nurses practice their injection technique on oranges.

Film 5

Coping With Diabetes. 1985

(Courtesy of Tyne Tees Television Ltd).

An intimate portrayal of life with diabetes. Judith describes how people first reacted to her twice-daily injections.

Film 6

The Blood Donor. Script by Ray Galton and Alan Simpson. 1961

(Courtesy of Roger Hancock Ltd and BBC Worldwide Ltd)

A clip from an episode of the BBC's Classic Comedy Series. Tony Hancock gives his all as well as his blood.

Film 7

Trainspotting. 1996

(Courtesy of Channel 4)

"I'll proceed directly to the intravenous injection of hard drugs please." Ewan McGregor, as Renton, overdoses on heroin.

Some have argued for South Asia as the probable cradle of smallpox; while others contend that it originated at the time of the first agricultural settlements in Africa around 10 000 BC, and then spread to India by Egyptian merchants. The first recorded smallpox epidemic occurred in 1350 BC, during the Egyptian–Hittite war. It is thought likely that its spread to Europe in the Middle Ages was considerably assisted by the movement of people associated with the Holy Crusades. At its peak, smallpox was the most devastating disease known. It has been estimated, for example, that in the century before Jenner's discovery of smallpox vaccination some 60 million Europeans died from the disease.

Smallpox generally starts with a rash that then causes itching spots, which become the tell-tale pustules that gave the disease its name. The surface of the skin, mouth, tongue and throat are the most affected areas, which commonly make diagnosis of the disease an unambiguous matter. Up to 50 per cent of those attacked by severe smallpox die, with almost all who survive being left with varying amounts of consequent disability and disfigurement.

Variolation (inoculation against smallpox using samples of the disease from less virulent cases) is a rare example of a medical technique that was common in parts of Africa and Asia, and which was then adopted in Europe. The best known champion for the technique in England was Lady Mary Wortley Montagu, who brought the practice back from eighteenth-century Turkey. Its introduction in Britain, involving at times mass inoculation campaigns affecting thousands of people, prompted men like James Jurin to study the numerical effectiveness or otherwise of inoculation, which in turn led to the evolution of statistics as a branch of practical mathematics. Despite inoculation, the scourge of smallpox worsened in the eighteenth century; in England one in ten people died of the disease in the second half of the century. The practice of variolation became illegal in France in 1762; though only in 1840 did it become so in England.

The method of inoculation against smallpox was introduced into England some 30 years before Edward Jenner was born. And as a child, Jenner was himself inoculated. Vaccination for smallpox using cowpox rather than smallpox matter was a technique fundamentally derived from the popular observation that infection with cowpox would confer on those infected an immunity to smallpox, the great benefit being that cowpox was not, for humans, the killer disease that smallpox was. Any number of claims, both then and since, have been made for individuals who discovered this fact, and who practised the technique of 'vaccination' before Jenner. Jenner's unchallenged innovation, however, was systematically to attempt to prove the method's effectiveness and to announce his discoveries publicly. One of his other more technical discoveries was that it was important to use cowpox material before it went into a so-called 'degenerated state'. It was actually Jenner's surgeon friend

Richard Dunning who introduced the term ‘vaccination’ – from the Latin *vaccinus* ‘relating to cows’.

The success of Jenner’s work in developing a smallpox vaccination is such that some have held on to it as the single notable exception to the general conclusion that early modern medicine had little or nothing to do with the gradual decline in the devastating effect of various disease ecologies. It has also been said of Jenner’s discovery, that it “transformed smallpox from a medical disease into a societal delinquency” – that is from a scientific quest for a cure to a social and political one of distributing an effective virus.

Exhibits

1.1 (a) John Zephaniah Holwell, *An Account of the Manner of Inoculating for Small Pox in the East Indies...* London, 1767. (b) The deity Maddi Ramamma, the Indian goddess of smallpox. Cast brass figure. India. 1880–1920

John Holwell (1711–1798), a governor of Bengal and one of the 23 survivors of the Black Hole of Calcutta, describes in his *Account* the practice of inoculation in India which used matter drawn from pustules of an inoculated patient, which he claimed was a method used since ‘time out of mind’. The far more dangerous technique of inoculating with matter drawn from the sores of smallpox sufferers had been introduced into Britain in the eighteenth century by Lady Mary Wortley Montagu. In the 200 years since the publication of Jenner’s treatise on smallpox inoculation, it is still not known absolutely what makes the smallpox vaccine, or any other live ‘attenuated’ vaccine, function as a vaccine. This lacuna in medical knowledge hampers the quest for an AIDS vaccine and vaccines for diseases ranging from cancer to the common cold.

(a) EPB – 29240/B; (b) loaned by the Science Museum – A301748

1.2 (a) *To shin zetsu zu*. Japan. 1788. (b) Powder insufflators in bronze. China

The Japanese manuscript on the effects of smallpox as they appear on the lips and tongue represents a mixture of ‘traditional’ Japanese medicine and new medical practices developed as a result of Dutch influence in the eighteenth century. Insufflators were used to apply the inoculum (substance used for inoculation). Pulverized dried smallpox pustules were placed in the drums of the insufflators, the contents of which were then sucked up into the nose.

(a) Oriental Collections – Japanese MS 11; (b) loaned by the Science Museum – A624406, A6244099,

A132625

1.3 Rhazes, *De Variolis et Morbillis*. London, 1766. Translation by John Channing

The first medical description of smallpox that has survived was composed by Rhazes in the tenth century. It also contains the first theory of acquired immunity. Translated early on into Syriac and Greek, it did not appear in Latin until 1747. This book is the translation of the work by the London apothecary, John Channing, in which Arabic and Latin texts are printed on facing pages.

EPB – 43795

1.4 (a) The Smallpox Hospital, St Pancras, London. Engraving, 1771. (b) The Finchley encampment for smallpox. Watercolour by Frank Collins, 1881

The area surrounding present-day King's Cross railway station has a less than salubrious reputation, perhaps due in part to the pervading history of the site. Home to a huge dust heap mentioned by Dickens in *Our Mutual Friend*, the area also housed the London Smallpox and Inoculation Hospital from 1746 until replaced in 1852 by the opening of the King's Cross terminus. The Director of the Hospital, William Woodville, was concerned at the spread of smallpox from the inoculated, which "greatly contributed to swell the bills of mortality for the metropolis". General inoculation as practised by Thomas Dimsdale, prevented the spread of disease by inoculating large numbers, even whole villages, at once. Prior to 1852, the Smallpox Hospital relocated to Finchley as a tented encampment allowing isolation treatment for sufferers.

Iconographic Collections – cat. nos (a) 38699; (b) 38715

1.5 Lady Mary Wortley Montagu (1689–1762). Lithograph by A Devéria after C F Zincke. [Illustrated]

The celebrated Lady Mary Wortley Montagu is credited not only with creating the vogue in England for oriental costume *à la turque*, which she herself wears in this portrait, but more importantly for returning from her husband's ambassadorial residency in Constantinople with a method for smallpox immunization. The practice of variolation had spread to the Ottoman Empire from China and as Lady Mary wrote, involved transferring from mild smallpox victims "as much of smallpox venom as could lie on the head of a needle" into the skin of the healthy. Two accounts of the variolation technique were published in the *Philosophical Transactions*, shortly before Lady Mary's departure to Turkey in 1716. Her first-hand observation of the practice in Turkey emboldened her to variolate her son.

Iconographic Collections – cat. no. 6994

- 1.6 (a) Edmund Massey, *A Sermon Against the Dangerous and Sinful Practice of Inoculation. Preach'd at St Andrew's Holborn, on Sunday, July the 8th, 1722.* London, 1722. (b) Unidentified diary of a London doctor, June – August 1786**

Religious arguments against inoculation and subsequently vaccination were often based on the grounds that to implant a disease deliberately into a healthy person contravened the sixth commandment: thou shalt not kill. At about the same time as Edmund Massey railed against forcing a 'dangerous distemper' upon the public, a fellow reverend in the American colony, Cotton Mather, learned the practice of variolation from a slave and persuaded local doctors to perform the first inoculations in America. The diary of an unidentified doctor centres his practice around Lamb's Conduit Passage, not far from the future site of the London Smallpox and Inoculation Hospital at King's Cross. His diary is open to a description of a child seized with smallpox and his prescription of 'Sena Tea' (a purgative). The child died the eleventh day after the eruption, and the doctor records that it was the fourth child to die of smallpox in that house. The diary also offers a glimpse of his personal life, such as his losses at billiards: "Won 5 games lost 3 ergo 6d. Made a resolution not to play again for some time."

(a) EPB – 35821/B; (b) WMS – 1856

- 1.7 (a) Edward Jenner, *An Inquiry into the Causes and Effects of the Variolae Vaccinae.* London, 1798. [Illustrated] (b) Edward Jenner's lancets in tortoiseshell case by Weiss of London, early nineteenth century. [Illustrated] (c) A piece of cow hide from 'Blossom' – the cow that infected the dairymaid from which Jenner took the cowpox material for his original vaccine**

An Inquiry is Jenner's highly influential published announcement of his discovery of smallpox vaccination. Initially published at his own expense, it quickly went into multiple editions in a variety of languages. The illustration is of the cowpox-infected hand of a dairy maid, from which Jenner extracted matter, then transferred by lancet into the arm of a healthy boy, who subsequently became immune to smallpox. Jenner was quietly confident about the implications of his discovery, and asked "may we not infer that a mode of inoculation may be introduced preferable to that at present adopted?" Rather than deriving matter from a cow, a more convenient method widely adopted was to transfer vaccination material from arm-to-arm, though this did increase the risk of infection, which in turn led to a rising fear of vaccination in the nineteenth century.

(a) EPB – Spec. Coll.; (b) loaned by the Science Museum – A647698; (c) kept at St George's Library in the Medical School at Tooting, London

1.8 (a) A vaccine pustule on the seventh to eighth day. Watercolour, c.1801. (b) A comparison between vaccinated (cowpox) and smallpox pustules from the third to twentieth day of the disease. Coloured etching by W Skelton after W Cuff

The reverse of the watercolour of a vaccine pustule explains that it was “painted by a French artist and presented to a member of the Medical Society of Paris in 1801”. Though at war with Britain at the time, Napoleon struck a medal in Jenner’s honour and made vaccination compulsory in the French army. Speculation about the relationship of cowpox and smallpox varied considerably; Jenner himself thought that both might somehow derive from a horse disease called ‘grease’. Ironically, a patient vaccinated with cowpox matter against the onset of smallpox is not then immune to subsequent infection with cowpox.

Iconographic Collections – cat. nos (a) 20111; (b) 20128

1.9 Luigi Sacco, *Trattato di Vaccinazione con Osservazioni sul Giavardo e Vajuolo Pecorino*. Milan, 1809.

Jenner’s *Inquiry*, which was quickly translated into most European languages, rapidly became an international bestseller. Luigi Sacco was known as the ‘Jenner of Italy’ by dint of establishing authentic vaccines in Lombardy, and becoming one of the foremost vaccinators on the Continent. Sacco found a strain of indigenous cowpox from which he created a vaccine that did not cause eruptions. His strain was distributed widely throughout many parts of the world, and as many as 90 000 vaccinations in Italy alone may have used this strain. Two important outcomes have been claimed for the distribution of Sacco’s vaccine: it provided independent confirmation that cowpox protects against smallpox, and it refuted the view held by some contemporaries that most of the early vaccine derived from attenuated smallpox from the London Smallpox and Inoculation Hospital.

EPB – 45634/D/1

1.10 Edward Jenner. Portrait in pastels by J R Smith. 1800. [Illustrated]

Fashion in the eighteenth century had uncontrolled sway in announcing the ranks and stations of men, and here Jenner is clothed every inch the Georgian gentleman, standing in the foreground of a bucolic landscape. The symbols of Jenner’s professional triumph appear in the background. Berkeley Castle, in the constituency where Jenner administered his first vaccination, is the backdrop for grazing cows and a dairymaid balancing a churn of milk on her head as though a street trader from a *Cries of London* plate. It was in May 1796 that Jenner recorded having taken cowpox material from the dairymaid Sarah Nelmes and vaccinated eight-year-old James Phipps with it, thus protecting the boy against infections with smallpox. The key elements in this scene, particularly the cow, have, through endlessly repeated use, become almost iconic of the man and his discovery.

Iconographic Collections – icv 18291

1.11 (a) Postcard showing bronze statue of Edward Jenner by Giulio Monteverde (1837–1917). (b) Statue of Edward Jenner in Boulogne. Wood engraving. 1865

Jenner's public acclaim was such that numerous portraits, busts and sculptures were made in his honour. The sculpture of Jenner vaccinating his son(?) is a bronze version of the marble exhibited at the Universal exhibition in Paris in 1878, and can be seen in the Wellcome Trust's 'Science for Life' exhibition. The fame of Jenner and his discovery spread throughout Europe at almost the same speed as the practice of vaccination that he pioneered. In France in particular he was taken up as a universal hero, and a debt of gratitude from the French nation is inscribed on the Jenner statue in Boulogne, "La France reconnaissante".

(b) Iconographic Collections – cat. no. 4765

1.12 (a) Edward Jenner's leather-covered tobacco box. Inscribed 1821. (b) Edward Jenner's chamber candlestick with snuffer. Made by N J & Co. (Sheffield), 1801. (c) Locks of Edward Jenner's hair, one framed

The box carries Masonic symbols and a family crest, and the candlestick carries his crest and monogram. The framed lock of Jenner's hair contains an inscription indicating it was taken when Jenner was 55 years old in 1804. The rise of Jenner's reputation to that of medical hero was swift, and was accompanied by a near-religious reverence for anything associated with the great man. Medical professionals in particular seemed to seek vocational if not spiritual inspiration through Jenneriana.

loaned by the Science Museum – (a) A683013; (b) A683024; (c) A683004 and A645175

1.13 (a) 'Dr Jenner and the potato'. Watercolour by John Leech, c. 1846(?) (b) Edward F Dolan *Jenner and the Miracle of Vaccine*. New York, 1960. (c) Selection of promotional and commercial material from the Jenner Museum. 1997

John Leech was Chief cartoonist for *Punch* from 1841 to 1861, contributing more than 3000 drawings. His caricature shows a potato ('Paddy Fluke') greeting Jenner "Give us your hand old boy we're both waxy-naters" (i.e. 'vaccinators'). Very shortly after his discovery, Jenner became a figure of medical legend, with both him and his discovery being depicted and written about, sometimes flatteringly, and other times not. Somewhat simplistically, the blurb to Edward Dolan's biography, describes Jenner's story thus: "the humane rural doctor, the enthusiastic naturalist, the devoted husband and father, and above all, the dedicated scientist whose remarkable discovery of the vaccination process paved the way for today's triumphs in preventive medicine." The Jenner Museum material includes a range of publications relating to Jenner's home, his family tree and a reproduction of a poem of his, along with pencils, badges, postcards, a mug and a stuffed 'cuddly-toy' cow. Housed in his Gloucestershire home, the museum also records Jenner's other scientific exploits such as his experiments to launch a hydrogen balloon and his studies into the life cycle of the cuckoo.

(a) Iconographic Collections – cat. no. 29573; (b) Historical Collections – BZP/Jenner

Considerable controversy followed the announcement of Edward Jenner's discovery of smallpox vaccination. The early eagerness and enthusiasm associated with what seemed like nothing short of a 'medical miracle' gradually evaporated, especially in the wake of publicity surrounding the disastrous consequences of using flawed vaccines. Resistance to vaccination ranged across taxpayers, employers, politicians and medics. A number of physicians argued simply that vaccination did not work. Early and virulent resistance to the practice also came from those with an emotional or economic investment in the lucrative practice of inoculation with smallpox virus. While one particular critic, Dr Moseley, vocalized an argument that was also ripe for use in contemporary satire: namely that the use of cowpox matter was likely to lead to bestial qualities being transferred to those vaccinated.

Firm convictions about the ills of smallpox vaccination have lasted till our own day. Professor George Dick, for example, a renowned immunologist who died in 1997, argued throughout his life that smallpox vaccinations killed more than the disease. In 1962 he memorably accused Enoch Powell, the then Minister of Health who was promoting a smallpox vaccination programme, of "asking for a sacrifice of at least 20 babies a year".

Despite this continuing history of criticism, smallpox vaccination quickly gained widespread use, and was before long mandated in many European states. Bavaria, for example, had a vaccination law as early as 1807; while Sweden made even re-vaccination compulsory before 1850. The first British Vaccination Act was passed in 1853; the follow-up 1867 Act greatly increasing the penalties for failure to vaccinate children. It was the reinforced strength of this legal compulsion that in turn reinvigorated the anti-vaccination movement, which had always opposed such measures. It advocated at least the reduction of the strictures of these laws, which was achieved by the end of the nineteenth century, if not abolishing the laws altogether, which also came in 1909.

Historians and commentators are still divided about the impact smallpox vaccination had on lessening the severity and frequency of epidemics, with a significant number insisting that economic and social changes which resulted in higher levels of sanitation were far more effective. The vaccine did, however, play an incontestably significant part in the eradication of the disease. This had been an aspiration held by the champions of vaccination since the early nineteenth century; but its achievement was above all a supreme instance of the internationalization of medicine.

Smallpox was still reported in about a hundred countries in 1945. The World Health Organization, set up three years later, championed the cause, but also worked on an array

of fronts to realize it, for example setting about standardizing the vaccines. In 1967 there were still some two million casualties from smallpox in 42 nations; two deaths from smallpox were recorded in London as late as 1973. It was only four years later in 1977 that the last reported case of smallpox was recorded in Somalia. By 1980 the WHO was in a position officially to declare the disease eradicated, and many today predict that no-one will ever again die of smallpox.

This extraordinary development has led to the intriguing issue of what to do with the smallpox isolates, stored, initially in laboratories throughout the world, and finally in the Centers for Disease Control in Atlanta, USA, and the Institute for Viral Preparations in Moscow, Russia. Should they be destroyed or instead saved for possible future study or use, or even just because their destruction would constitute the first premeditated extinction of an organism. The pro-destruction lobby contends that since the smallpox genome has been sequenced and cloned into plasmids, all that can be known about it has been recorded, and that an escape of the virus might bring a return of worldwide epidemics. Others have argued that considerable fruits could still be expected from further study.

Exhibits

2.1 (a) Tombstone of Peleg Conklin “who died of the smallpox by inoculation Jan 27th 1788”. Reproduction of photograph (b) Tombstone of Benjamin Jesty (1816) “noted for having been the first Person (known) that introduced the Cow Pox by Inoculation...in the Year 1774”. Reproduction of photograph

The tombstone of Peleg Conklin in Fort Hill cemetery, Huntington, New York is inscribed with the stark record of his death in 1788 aged 17 by ‘the smallpox inoculation’. Peleg’s death post-dates by five years the death of Octavius, son of George III at the age of four, also by smallpox inoculation. Jesty’s tombstone on the other hand, heralds his work as “the first person known that introduced the Cow Pox by Inoculation”. Jesty’s claim to have inoculated his family with the cowpox in 1774 was but one of several such claims not brought to light until after the publication of Jenner’s *Inquiry* in 1798. Jenner believed these attempts to claim credit were brought about by competitive colleagues aiming to discredit him.

2.2 (a) Smallpox poster. Colour lithograph after René Gauche. 1960s(?). (b) *The Global Eradication of Smallpox*. Final Report of the Global Commission for the Certification of Smallpox Eradication. Geneva, 1980. (c) Arnold Sanderson, *Smallpox is Dead*. London, 1988

Smallpox was singled out as a disease to eradicate at the formation of the World Health Organization in 1948, but it was not until 1958 that WHO explicitly called for its extinction. The shadowy face of smallpox formed by red and yellow circles stares out from a WHO poster offering \$1000 reward for notification of cases of the disease, offer “valid until global eradication is certified”. The 1980 Global Eradication report asserted that not only had smallpox been eradicated worldwide, but that there was “no evidence that smallpox will return as an endemic disease”. But can we still take for granted this confident assertion? There is continued debate about the capacity of the smallpox virus to survive its victims *post mortem*. Under dry conditions the smallpox virus can survive in scabs for long periods of time. Currently the National Institute for Virology in South Africa (coincidentally one of the last laboratories in the world to hold stocks of the smallpox virus) is concerned regarding redevelopment of an Infectious Diseases Hospital near Johannesburg where thousands of smallpox victims were buried in unmarked graves. In 1997, repairs to tombs at Kensal Green Cemetery in London were prolonged by the enforcement of Home Office guidelines preventing anyone on site who could not show a smallpox vaccination mark as proof of immunity.

(a) Iconographic Collections – cat. no. 12003; (b) Historical Collections – FSC.AA

2.3 (a) Joseph Adams, *A Popular View of Vaccine Inoculation, with the Practical Mode of Conducting it*. London, 1807. (b) Card showing (left) face of a man suffering from smallpox and (right) vaccination against smallpox. Spain (?). c. 1940. [Illustrated]

Royal patronage of various societies and hospitals connected with smallpox indicated to the wider public the importance placed on the elimination of this scourge. George III and Queen Charlotte were asked to be patrons of the Royal Jennerian Society founded in 1803 to vaccinate the poor, and the Duke of York was honorary President of The Smallpox and Inoculation Hospital, at which Adams was a physician. At the request of the vaccination enquiry committee of the Royal College of Physicians, Dr Adams supplied a register of the 17 cases of smallpox (of which two died) out of 20 323 patients vaccinated at the Smallpox and Inoculation Hospital at St Pancras for the eight-year period from 1799–1807. The card carries the inscription “vacunese contra la viruela”, and is indicative of the many national vaccination measures introduced in the nineteenth century, particularly amongst military personnel.

(The copyright holder of exhibit 2.3b has not been traced, but The Wellcome Trust would be glad to receive such information for inclusion in the Library catalogue and for the advantage of future enquirers)

(a)EPB – 10289/B; (b) Iconographic Collections – cat. no. 39483

2.4 (a) 'The law of vaccination'. Newspaper cutting. c. 1869. (b) Shaws' Manual of the Vaccination Law: Containing the statutes, orders, and regulations... London, 1887. (c) 'Triumph of De-Jenner-ation. The bill for the encouragement of smallpox was passed'. Wood engraving by Sir E L Sambourne. Published in *Punch*, 1898

Vaccination in the nineteenth century progressed from voluntary to obligatory to compulsory. The newspaper clipping records the prosecution of a London doctor for failure to immunize his child against smallpox. His defence centred on his belief that vaccination was injurious and propagated disease. Both judge and defendant agreed they would be likely to meet in court again, as the doctor's unwillingness to vaccinate meant that he was liable for repeat prosecutions. At either corner of this debate were The Anti-Vaccination League, which maintained a defence fund to pay the fines of such conscientious objectors, and The Society for Promoting Vaccination – known as the Jenner Society. In the *Punch* cartoon Death wields his scythe and clutches the Vaccination Acts Amendment Bill, while trampling a copy of the *Lancet*, a vocal advocate of the Bill. Among other recommendations, the Bill proposed glycerinated calf lymph vaccination rather than arm-to-arm vaccination. As a compromise between the rights of the individual and the rights of the state, the Bill stated that only a single prosecution and fine could be raised for any one failure to vaccinate. The protesters eventually triumphed in 1909, when Parliament rescinded compulsory vaccination.

(a) EPB – BFI; (b) Modern Medicine Collection – WC585 1887S53m; (c) Iconographic Collections – cat. no. 14318

2.5 Vaccination. Oil painting by Louis-Léopold Boilly (1761–1845). c. 1807. [Illustrated]

A French bourgeois household clusters around a young child seated on his mother's lap as a doctor administers a vaccination. The woman seated to the left cradles a child who has already been jabbed and who points at the scratch on his upper arm, whilst a young girl lays a comforting hand on his knee and gazes with trepidation at the doctor. The doctor is bewigged and clothed in a manner fashionable during the *ancien régime*, a style which by the early nineteenth century had become recognizable as a sartorial shorthand for a doctor. The first French edition of Jenner's work on vaccination dates from 1800.

Iconographic Collections – cat. no. 40474

2.6 'Le Nec Plus Ultra'. Coloured etching. Paris, c. 1807

The popular translation of *ne plus ultra* is 'the perfect point', but the literal translation means 'go no further' a warning allegedly inscribed for sailors on the pillars of Hercules at Gibraltar, serving here to put people on their guard against the possible dire results of vaccination. 'Le Citoyen Marchelli' is shown obtaining matter for inoculation from a sheep.

The caption satirically likens the controversy surrounding the discovery of vaccination to the ill treatment of such great discoverers as Galileo, Harvey and Descartes. Following the publication of Edward Jenner's discovery of vaccination in 1798, many animal pox viruses were investigated.

Iconographic Collections – cat no. 16149

2.7 'La malheurs de la vaccine'. The history of vaccination from an economic point of view. Coloured etching. France c. 1800

The etching depicting the economic appraisal of the impact of vaccination shows a pharmacy up for sale, an outmoded inoculator selling his premises, while to the left Jenner can be seen pursuing a skeleton with a lancet. It serves to emphasize the fact that like so many medical discoverers, vaccination brought with it profits for some, but ruin for others. This was one of a series of vaccination-related coloured prints produced by Depeuille. Others in the series satirized the dandified airs of the practitioners of the 'new' technique and the gullibility of their patients.

Iconographic Collections – icv 16140

2.8 'The Cow-Pock – or – the Wonderful Effects of the New Inoculation!' Coloured etching by J Gillray, 1802. [Illustrated]

A shambling queue of patients enters a surgery and after being spoon-fed with 'opening mixture', and having Dr Jenner inoculate them, file out with bovine growths erupting on their bodies. The blue-coated St Pancras charity boy, who may be a caricature of Dr William Woodville, mocks a non-existent charity school and implies that the surgery is at the London Smallpox Hospital at King's Cross, of which Woodville became Director in 1791. He holds a pot labelled "vaccine pock hot from the cow", and a paper in his pocket is entitled the "Benefits of the vaccine process". The framed picture on the surgery wall shows a crowd genuflecting to a statue of a cow, and was meant to draw a parallel between the apocalyptic predictions of the feared bestial effects of smallpox vaccination and the biblical story of the golden calf, which was worshipped by the Israelites almost causing their destruction by God. The fearsome growths on the patients may refer both to Dr Woodville's failed attempt in 1799 successfully to inoculate from a cowpox outbreak at a local dairy, and to public fears of the perceived bestial repercussions of treating humans with matter drawn from animals.

Iconographic collections – cat. no. 11753

2.9 A health inspector dismayed to discover that a mother thinks her child has been vaccinated because he has been butted by a cow. Wood engraving by C Keane. England, 1877

The National Vaccine Establishment in Leicester Square (est. 1808) was directed by Government in 1814 to “extend the benefits of vaccination to all parts of the British Dominion” in response to the mortality rates of the poor from smallpox. By 1853, this benevolent act was replaced by the first obligatory vaccination law. In 1867 the Boards of Guardians were permitted to appoint vaccine officers to enforce the law, and in 1871 permission changed to a compulsory law. This *Punch* cartoon shows a vaccine officer in conversation with a poor woman and her son. “Oh he has been vaccinated, You say! Then show me the marks on his arm,” to which the mother replies, “Oh, that he hav, sir! But not...It was this way, you see, Sir! Farmer Aker’s Cow she runned after the children, an’ ketches my little boy, and torssed him right over the hidge.” This joke highlighted the often wild and ludicrous misapprehensions about the administration of the vaccine, either actually held by the general public or invented by those eager to ridicule their resistance to the medical practice. Incidents of contaminated vaccines or incompetent quack practitioners only served to heighten the fears of some about the new practice.

Iconographic collections – cat. no. 13814

- 2.10** (a) Thomas Duxbury, *Vaccination and Other Rhymes*. Blackburn, c. 1887. (b) John Pickering, *Which? Sanitation and sanatory remedies, or vaccination and the drug treatment?* London, 1892

The non-committal title to Pickering’s work soon gives way to a diatribe against the ‘evils’ of vaccination. The author was a vocal anti-vaccinator, editing a journal of that title from 1872–73. The illustration “shows the effects of vaccine blood-poisoning”. In his collection of poems, Duxbury made “no claim to [any] literary ability”, advertising instead that “each piece is founded on actual fact”. Along with the title verse, other poems included in the anthology are ‘Why do the children die?’ and ‘The hypocrisy of the age’. Profits from sales of the book were to be added to the funds of the Blackburn and District Anti-Compulsory Vaccination Society. Another work from this viewpoint was simply entitled *Horrors of Vaccination Exposed and Illustrated*; while on the other side of the argument, a book published in New York in 1887 was entitled *Vaccination Vindicated: Being an answer to the leading anti-vaccinators*. Much of the debate about vaccination, and before that inoculation, was fuelled by facts and figures, with the consequence that these debates provided a significant impetus in the development of statistics.

(a) Modern Medicine Collections – WC585 1892P59w; (b) Historical Collection – FSC.AI

- 2.11** (a) ‘Successful vaccinations [Cairo lymph]’. Reproduction of photograph showing arms with vaccination marks from an album of pictures taken during a smallpox epidemic in Palestine. 1922. (b) Thorns used in vaccinations during Palestinian smallpox epidemic. 1922

Even in the second half of the twentieth century, smallpox has periodically reappeared in epidemics throughout the world. In the mid-1960s it was endemic in over 30 counties, with more than two million people dying of the disease annually. The photograph is reproduced from an album of pictures taken during an 'Anti-smallpox Campaign Dawaimeh-Hebron. January – February. 1922'. For most of its early history, smallpox vaccinations were administered by nicking the skin with a lancet and placing some vaccine material in the small wound. As is indicated by the thorns displayed here, a variety of other means of applying the vaccine appropriate to local environments were later developed.

(a) Iconographic collections – cat. no. 30519; (b) loaned by the Science Museum – A657117

2.12 (a) Ch'iu-Hsi, *Yin-tou lüeh ho pien*. [margin title] (1895). (b) Alexander Pearson, *Ying-chi-li kuo hsin-ch'u chung-tou ch'i-shu*. Shanghai, second edition, 1805 Ch'iu-Hsi's book is the first Chinese work on smallpox vaccination, originally published in 1817. He incorporated both Chinese ideas, and Western ones from his teacher, Alexander Pearson. Pearson's own work on European vaccination, translated into Chinese by Sir George Thomas Staunton, is also shown. One of the illustrations shows the knife and spatula used to apply vaccine and a figure of a patient's arm indicating where the vaccine should be applied. The rapid spread of knowledge of Jenner's work around the world was accompanied by the physical transfer of the vaccine either as a dried product or initially by transporting the live virus, sometimes on the bodies of people infected with cowpox and sometimes on infected cows.

Oriental Collections – (a) Chinese 51; (b) Chinese 53

2.13 (a) Smallpox vaccine kit in leather case. Nineteenth century. (b) Vaccination case with contents by Down Bros. London 1927(?). (c) Child's vaccination shield and box. England. Late nineteenth century. (d) The back of a person who has reacted to a smallpox vaccination. Reproduction of photograph

The method of applying smallpox vaccinations has changed considerably over its 200-year history as has the source for the vaccine material. In Jenner's time a lancet was commonly used to remove material either from an animal or human infected with cowpox. Another tool employed was a sharp semi-porous implement soaked in a solution containing the virus. Only later in the twentieth century has a hollow needle been used, to apply vaccine material grown and processed in laboratories. No matter what method is used, it is still the case that some patients will have an adverse reaction to the vaccine, as is shown in the photograph.

Loaned by the Science Museum – (a) A651830; (b) A615134; (c) A615120; (d) Wellcome Trust Medical

Photographic Library – no. 9032 999.0

2.14 (a) Protective amuletic necklace of wild banana seeds, cowrie shells and twigs. Ganda and Ankole people (Uganda). 1870–1920. (b) Wooden staff, decorated with leather, cowrie shells and horn. Yoruba people (Nigeria)

The necklace was said to protect its wearer against smallpox, while the wooden staff was used in communicating with Shapono, the Yoruba god of the disease. Like many medical innovations, smallpox vaccination remained practically unknown in much of the world for many years. Elsewhere it was used in combination with more traditional, indigenous treatments, such as inoculation.

loaned by the Science Museum – (a) A301576; (b) A301693



A.2

A.2 Polio poster by Reginald Mount.

(Crown copyright is reproduced with the permission of the Controller of Her Majesty's Stationery Office)

1.5 Lithograph portrait of Lady Mary Wortley Montagu by A. Devéria.



1.5



1.7a



1.7b

1.7a Plate 1 from Edward Jenner's *An Inquiry into the Causes and Effects of the Variolae Vaccinae*.

1.7b Edward Jenner's lancets in tortoiseshell case.
(Courtesy of the Science and Society Picture Library, Science Museum)

1.10 Pastel portrait of Edward Jenner by J R Smith.



1.10



2.3b



2.8



2.5



3.1a

2.3b Card illustrating smallpox vaccination.
[in copyright: see exhibit caption]

2.5 Oil painting by Louis-Léopold Boilly:
'Vaccination'.

2.8 Coloured etching by James Gillray:
'Cowpock'.

3.1a Collector's card of Pasteur inoculating
for rabies.



3.12a

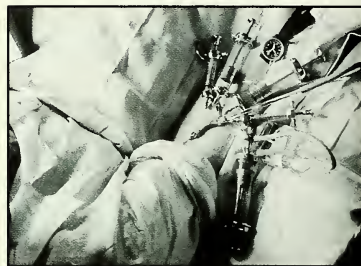


4.1a, b and c

... six, seven, eight months. Gosh, time I was
IMMUNISED *against*
DIPHTHERIA'

Ask your
 family doctor
 or at the
 Welfare Centre

3.4b



4.6a



4.11



4.12c



4.12a

3.4b Diphtheria immunization poster by Reginald Mount. (Crown copyright is reproduced with the permission of the Controller of Her Majesty's Stationery Office)

3.12a Photograph of mass disease eradication campaign in West Africa.

4.1a, b and c Enema syringes. (Courtesy of the Science and Society Picture Library, Science Museum)

4.6a Photograph of Dr Elsie Widdowson's self-experimentation.

4.11 Engraving of an allegory of the sense of touch.

4.12a Oil painting by Luciano Nezzo of a surgeon holding a dental key behind his back.

4.12c Photograph of an anaesthetic needle from the patient's viewpoint.



4.13b



4.14c



4.17



6.6a



5.3



6.1

4.13b Watercolour: 'The village doctor besieged'.

4.14c Drawing by Fred May: 'Windy moments – No 1 Being inoculated'.

4.17 Detail from work in mixed media by Aidan Shingler: 'Rest in pieces'.

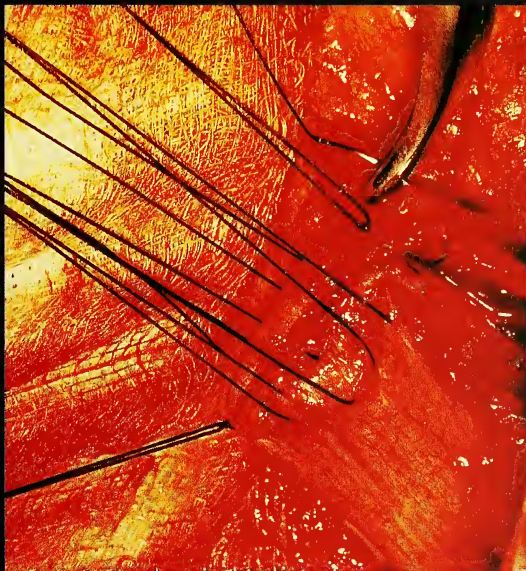
5.3 Acupuncture chart of a seated man.

6.1 Marginal illustration from medical manuscript.

6.6a Stipple engraving by John Bell demonstrating how to stitch head wounds.

6.8 Painting by Erika Itta: 'Heart Bypass' no.15 (over the page).

6.11 Photograph of suturing in process by Norman Matheson.



6.11



Edward Jenner's work on smallpox vaccination is often claimed as the foundational event for all subsequent immunological work in controlling diseases. Almost 100 years, however, were to elapse before the next major 'breakthrough' relating to a specific disease. Louis Pasteur, who was one year old when Jenner died, worked in conscious imitation of Jenner and set about inventing other 'vaccines' – that is developing solutions with bacteria from diseases, which in being modified by heat or alcohol would, he hoped, cause mild subclinical attacks of the relevant disease and thereby confer immunity to those vaccinated. Pasteur's most triumphant legacy in this area was his rabies vaccine, first tried on nine-year-old Joseph Meister in July 1885. This success sealed Pasteur's reputation as both scientist and national hero, and with significant government funding and public subscriptions, led to an institute in his name being set up, part of whose mission was to produce vaccines for all infectious diseases.

Since then, the laboratory-based 'scientific medicine' being invented has gone on to produce a number of substances conferring antiviral and antibacterial immunity: for cholera in the 1890s (though only with short-term immunity), for plague in 1895 and again 1901 (conferring in this case a useful degree of immunity, but only for some months), for diphtheria and tetanus in the mid-1910s (these being prepared from blood serum of immunized animals), for typhus fever in 1916, for measles in 1918, for whooping cough in 1933, for typhoid in 1934, for yellow fever in 1936 (though here only a partially effective vaccine), for polio in the 1950s, and so on. In total, however, less than a dozen effective vaccines have been produced; though some of them have been put to work throughout the world. The increasing use of vaccines has dramatically reflected the evolving role of medicine itself, which has gradually shifted from being seen as a responsibility of the individual to that of the state and finally the whole world – a development most emphatically embodied in the global campaigns for the mass eradication of smallpox by the WHO, and more recently in UNICEF's polio vaccination programme. Other diseases such as cholera, which had been declining in Africa, are now on the rise again.

The history of vaccinations has also been punctuated with a number of notable tragedies involving defective vaccines – for example, the trials of BCG vaccines at Lübeck in 1930, which resulted in 72 out of the 251 children vaccinated dying. While only recently, a *Daily Telegraph* headline ran: "Parents ready to sue over child vaccines," the article going on to report that more than 1250 parents had legally registered case histories of the ill-effects that they had noticed in their children after vaccination. The measles, mumps and rubella jab has in particular allegedly produced alarming side-effects for a number of infants. The cumulative consequence of such episodes has been to leave shadows of doubts both about the effectiveness of specific vaccines, but also about the whole idea amongst some of the

public and indeed some medical professionals.

The issue of vaccination seems in fact to be an increasingly controversial one. Particularly contentious have been recently unearthed stories about the use of unwitting guinea-pigs for testing viruses. In Australia, the employment of orphan babies for vaccine experiments during the Second World War has caused bitter recriminations, as has the similar treatment of Down's syndrome babies in the UK in 1960; while contention also continues over the later experiences of many Gulf War troops. A recent allegation made in the USA is that some 8000 soldiers were unknowingly injected with an unlicensed experimental vaccine having uncertain side-effects, despite an Army review board's recommendation against doing so.

Balanced against these bad-news stories, however, patients with all manner of complaints still routinely have their hopes raised by suggestions that the development of a vaccine for their particular problem might be just round the corner: vaccines for multiple sclerosis, AIDS, asthma, pneumonia, arthritis, meningitis and even some cancers have all been suggested as being but years away. Plasmid DNA-type vaccines, which, unlike conventional vaccines, carry only a select microbe gene and not the entire information code of the live virus, might provide absolutely pure vaccines with guaranteed effectiveness: the 'magic bullets' of modern medicine. Such hopes have led a recent *Daily Mail* article to ask: "Will there come a day when we can be vaccinated against virtually every illness?" And some optimistic doctors still dream of a one-shot super-vaccine that would protect against all the common invasive bacteria.

Exhibits

3.1 (a) Collector's card showing Pasteur inoculating a man with the rabies virus. Chromolithograph. c. 1895–1900. [Illustrated] (b) 'Institut Pasteur et ses annexes'. Pamphlet. Early twentieth century. (c) Packets of human rabies vaccine in syringe form ready for pre- and post-exposure use, by Institut Pasteur. Paris. 1983 and 1985

The postcard, which also served as an advertisement for chocolate, shows Louis Pasteur inoculating the rabies virus into the stomach wall of a standing man. The scene would seem to be made up, since the first rabies inoculations appear to have been made by his colleague P P E Roux in the presence of Pasteur, who, as a chemist and not a physician, was not considered qualified to perform them. Pasteur's best-known scientific achievement dating from the 1880s was the development of a 'vaccine' for the killer disease rabies. This was the discovery that launched his name into international celebrity. The pamphlet sets out the

various activities of the bacteriological, biochemical and 'sérothématique' (which prepared and distributed sera and vaccines) departments of the Institute set up in his name. This copy comes from the Lister Institute, which was set up in conscious imitation of its Parisian cousin.

(a) Iconographic Collections – cat. no. 38592; (b) CMAC – SA/LIS/Q.15; (c) loaned by the Science Museum – 1986 1233 and 4

3.2 The inoculation of an isolated plague patient in China. Reproduction of photograph by Arfo Mauritius. Early twentieth century

The Centers for Disease Control and Prevention in Atlanta, Georgia (USA) have reported recent cases of human plague in Angola, India, Kenya, Lesotho, Madagascar, Mozambique, Namibia, South Africa, Botswana, Tanzania, Uganda, Zimbabwe, Zaire, Myanmar, China, Mongolia, Vietnam, the USA, the former Soviet Union, Brazil, Bolivia, Ecuador, and Peru. Despite periodic outbreaks, the efficacy of human plague vaccine has not been demonstrated in a controlled trial, and only limited indirect data suggest that the vaccine may offer protection against acquiring flea-borne plague. In most of the countries of Africa, Asia, and Americas where plague is reported, the risk of infection exists primarily in rural mountainous or upland areas. Vaccination is rarely necessary in outbreak countries if travellers are staying in urban areas with modern hotel accommodations.

Iconographic Collections – cat. no. 34520

3.3 (a) Cholera vaccination of the Third Gurkas in India at the time of the 1893 epidemic. Reproduction of a wood engraving. (b) Two bottles of cholera serum from the Staatliches Institut, Austria. 1910s. (c) Oval amulet in green jade used as charm against cholera. Persia? Late nineteenth century

In 1854, two physicians Filippo Pacini in Florence and Arthur Hill Hassall in London independently discovered the germs of cholera in the intestines of the disease's victims. At around the same time, Dr John Snow demonstrated that cholera was a water-borne illness by mapping the incident rates of the disease in central London and determining that the Broad Street water pump was the source of the epidemic. The John Snow Pub now sits where the water pump stood. Louis Pasteur worked on a vaccine or antitoxin for chicken cholera (not related to human cholera), but a vaccine against human cholera had to wait for the work of Kolle and Haffkine. Even the resulting products were not entirely effective.

(a) Iconographic Collections – cat. no. 1992; loaned by the Science Museum – (b) A653672; (c) A45548

3.4 (a) Photograph of serum being taken from a horse for the manufacture of diphtheria antitoxin at the Lister Institute of Preventative Medicine. 1890s. (b) Poster showing a baby in need of immunization against diphtheria. Colour lithograph after Reginald Mount. [Illustrated] (c) Bottle of diphtheria antitoxin by the K K

Serotherapeutisches Institut, Austria. (d) Dr Roux's hypodermic syringe for use with diphtheria antitoxin, by Oppenheimer, Son and Co. London, 1890–1910

Pioneering research on anti-diphtheritic serum was conducted at the Wellcome Physiological Research Laboratories, work which has been claimed as the first biological therapeutic to emerge from scientific medicine. At the time diphtheria was claiming some thousands of young lives a year. Serum was produced from the blood of horses that had previously been inoculated with diphtheria toxin. Controversy surrounded the procedure with an article in *The Abolitionist*, for example, declaring that the activities of Burroughs Wellcome & Co. in this area would be “the objects of as much ridicule and disgust” in 20 years’ time as the quack remedies of two centuries before were then. The poster carries the legend “...six, seven, eight months. Gosh, time I was immunised against diphtheria”, and urges parents to enquire at family doctors or with welfare centres about immunization programmes.

(a) CMAC – SA/LIS/R.189; (b) Iconographic Collections – cat. no. 22656; loaned by the Science Museum
– (c) A661248; (d) A620592

3.5 (a) Anti-typhoid vaccination in the First World War. Reproduction of photograph. (b) ‘Report of Special Operational Store – Tyburn’. January to November 1945

The report is by Marinus van den Ende, Royal Army Medical Corps (1912–1957), and it relates to work in the laboratories of the Wellcome Foundation Ltd, which was engaged by the wartime Ministry of Supply to produce scrub typhus vaccine for the armed forces. It comes from the general papers of Marinus van den Ende, RAMC (1912–1957). The diagram and photograph are of one of the ‘inoculation cabinets’. It was Almroth Wright who developed the first effective typhoid vaccine based on using ‘killed-organisms’. It has been argued that widespread use of the vaccine might have prevented the huge toll of fatalities caused by the disease among British troops in the Boer War (1899–1902), but Wright had to wait several years to gain the political weight for the vaccine to be extensively used in the First World War. More effective anti-typhoid vaccines have since been developed.

(a) Iconographic Collections – cat. no. 14807; (b) CMAC – GC/12

3.6 (a) Poster of a sword in the form of the letter P, representing the fight against polio. Colour lithograph after A Games. 1954. (b) John Rowland, *The Polio Man: The story of Dr Jonas Salk*. London, 1960. (c) Reproduction of photograph of baby receiving polio vaccination by mouth. (d) Box containing ten doses of sabin-type polio vaccine made by The Wellcome Foundation Ltd, London. 1994

Polio is a viral infection of the nervous system, which mostly attacks children and can cause lifelong paralysis. Unlike earlier attempts, Jonas Salk’s work on a polio virus made use of

formalin to inactivate the three types of polio virus, and in so doing, he developed the first safe and effective vaccine against polio. The blurb for John Rowland's popular biography describes Salk's careful progressive work as a story of "how the seemingly impossible can be achieved by the patience, skill and dedication of the doctors of today". Much of the work on finding a polio vaccine was funded by voluntary donations, such as that generated by the US 'March of Dimes' scheme. The poster displayed is from the period just before the licensing of the Salk virus in spring 1955. It bears an image of a sword with lettering: "People against polio. Please send your pennies or pounds to the National Fund for Polio Research." As early as 1955, another polio researcher, Albert Sabin, advocated taking live polio virus vaccines orally.

(a) Iconographic Collections – cat. no. 20290; (b) Historical Collections – BZP (Salk); (c) Wellcome Trust Medical Photographic Library – N0013553C; (d) loaned by the Science Museum – 1994-192

3.7 (a) 'Are you sufficiently aware of tetanus?' Health awareness leaflet produced by Evans Vaccines. 1990s. (b) Six bottles of tetanus serum, by Behringwerke of Bremen. Germany c.1900. (c) Hypodermic syringe for tetanus antitoxins. Made in New York. Early twentieth century

Tetanus (lockjaw) is a disease caused by bacteria present in the soil, which can be introduced into the body through puncture wounds as trivial as that from a rose thorn. Ironically in the case of tetanus, not only are both the disease and its cure and prevention introduced through the punctured skin, but also the administration of smallpox vaccination was a frequent cause of tetanus infection. Early anti-tetanus 'vaccines' or antitoxins were 100 percent effective if used during the first 24 hours of infection, with decreasing effectiveness thereafter. However, in some First World War armies, their use meant that the potentially enormous effects of tetanus were largely dissipated, even if this only allowed wounded soldiers to return to the fields of combat.

(a) Modern Medicine Collections; loaned by the Science Museum – (b) A653736; (c) A623329

3.8 A doctor vaccinating a small girl. Gouache by Lance Calkin. c. 1901

In many European countries, vaccinations against smallpox were first initiated around 1800 and soon declared mandatory by vaccination laws. All children had to be vaccinated within their first year and again at the age of 12. A free certificate was issued after the vaccination. Fear for children's safety during vaccination has continued into the twentieth century. Current US immigration law requires all individuals seeking permanent residence in the USA to be vaccinated for all vaccine-preventable diseases prior to entry, and health experts are concerned that children adopted from poorer countries may be subject to inferior vaccines and inoculation practices. Foremost among these fears is that required

injections will be administered with unsterile needles, a frequent practice in some countries because of the shortage of disposable needles and syringes.

Iconographic Collections – cat. no. 20221

3.9 (a) Poster of a mother with a baby, referring to the need for immunization against infectious diseases. Colour lithograph after Reginald Mount and Eileen Evans. (b) 'A Guide to Childhood Immunisations'. Health Education Authority leaflet. 1997. (c) Immunization record card. 1997. (d) Box of BCG vaccine for protection against tuberculosis made by Evans Medical Ltd. England, 1994

Vaccines to prevent infectious diseases are acknowledged as one of the great medical success stories, and certainly the great majority of recipients experience no adverse side effects. Debate however does surround the effectiveness of childhood immunization, with some researchers arguing that the undeniable decrease in incidents of these diseases is largely unconnected to mass immunization programmes. A growing body of evidence also indicates that adverse reactions to two triple childhood vaccines, MMR (measles, mumps, rubella) and DPT (diphtheria, pertussis, tetanus) are not isolated events. The Centers for Disease Control in America have monitored the effects of these jabs on over 500 000 children, and major side-effects include diabetes, meningitis, polio, autism and Crohn's disease. Dr Andrew Wakefield of London's Royal Free Hospital has studied the incident rates of UK cases, and advocates an immunization programme of separate, rather than combined, vaccines.

(a) Iconographic Collections – cat. no. 22661; (d) loaned by the Science Museum – 1994-135

3.10 (a) "Doctors to be guinea pigs in tests of HIV vaccine". *The Guardian*, 23 September 1997. (b) "MoD blundered over vaccines for Gulf troops". *Daily Telegraph*, 29 October 1997

The use of both witting and unwitting guinea-pigs in medical research has a long history. *The Guardian* front page reports on the international group of doctors based in Chicago who announced that in an attempt to find a cure for AIDS they would experiment on themselves with a new vaccine containing the HIV virus. Permission to do the experiment has to be sought from the US Food and Drugs Administration. *The Telegraph* front page reports on the Ministry of Defence's 'blunder' in injecting Gulf war troops with "vaccines that had not been officially licensed". In the USA, up to 8000 unwitting soldiers were dosed with botulinum toxoid vaccine and pyridostigmine bromide as protection against Iraq's chemical weapons, but which are instead now believed to be the causes of 'Gulf War syndrome'. The only Gulf War troops not reporting these complaints are the French, who, interestingly, were not given these vaccinations.

3.11 (a) International Travel and Health: Vaccination requirements and health advice. Published by the World Health Organization. Geneva, 1989. (b) Traveller's vaccination pack and leaflets. 1997

The boom in long-haul travel in the last decade has resulted in a growing demand for health safety for travellers. The World Health Organization annually publishes this guide to the vaccination requirements for travellers. Sterile hospital conditions and a safe blood supply cannot be guaranteed in many parts of the world, and sterile medical travel kits offer some peace of mind. Unlike conventional first-aid kits, sterile kits are meant to be handed over to medical personnel in the event of serious injury or illness requiring injections, drips or stitches. The 'Life Systems' pack advertises itself as helping to protect travellers against the risk of contracting blood borne diseases such as AIDS or hepatitis, and includes a range of syringes. Both the Hospital for Tropical Diseases, St Pancras Hospital and MASTA (Medical Advisory Service for Travellers Abroad) at the London School of Hygiene and Tropical Medicine offer advice to travellers on prevention and immunizations.

(a) Modern Medicine Collections – TRO WA 110 1989 W92v

3.12 (a) Mass disease eradication campaign in West Africa. Reproduction of photograph. 1957. [Illustrated] (b) 'Soloshot' syringes approved by UNICEF and the World Health Organization for use in immunization programmes. Made by Becton Dickinson & Co., New Jersey, USA. 1990s. (c) Part of 'PED-O-JET' multidose jet injection apparatus made by Scientific Equipment Manufacturing Corp. New York, USA. 1970s

The lettering on the photograph reads "Vaccinating native girls at a mission station". The photograph is taken from Cecil John Hackett's archives. Hackett was director of the Wellcome Museum of Medical Science from 1945–54 and Senior Research Fellow in Tropical Medicine for the Medical Research Council. He was also involved in World Health Organization mass eradication campaigns in the 1940s and 1950s. The photograph is from a series showing the 1957 WHO campaign for the eradication of smallpox and yellow fever in French West Africa. The 'soloshot' syringes were made to autodestruct after a single use and the carrying box converted into a 'sharps box' (for used needles) to prevent the spread of AIDS from infected needles. The multidose injection device allowed for the safe injection of a great number of patients by a small mobile staff in mass inoculation campaigns of the type regularly mounted by such organizations as WHO and UNICEF.

(a) CMAC – WTI/CJH/4/13; (b) loaned by the Science Museum – 1994-150; (c) 1990-276 (or) 1981-1398

Needleless syringes have a history almost as long as medicine itself, with ancient recommendations for vaginal and anal cleansing, and ear and nose irrigation, all by the use of a large syringe (clyster). The attachment of a fine needle to the syringe is a relatively recent innovation.

The matter of who actually invented the hypodermic syringe is open to many interpretations. The first instance of a successful hypodermic injection was as early as 1657, when the architect Christopher Wren performed intravenous experiments on dogs. His efforts employed a gravity feed through quills, with the use of bladders or bulbs to increase the pressure of the injected liquid. Silver and gold pipes replaced quills in the next half century. François Magendie was experimenting with wooden barbs soaked in Javanese arrow poison in 1809, thereby pioneering the idea of a device used to inject substances into tissue. By 1836, G V Lafargue was dipping vaccination lancets in morphine, and then spiking the muscles of his patients with them. But for many, the true beginnings of hypodermic procedures dates from early in 1853 when the Frenchman Pravaz developed a syringe that many would recognize today, with a metal barrel, screwed piston and leather plunger which permitted the injection of more accurate dosages. At about the same time, Alexander Wood used an intravenous syringe to inject a patient in Edinburgh with morphine dissolved in sherry. Subsequently, the Dublin physician, Francis Rynd, claimed that he had tried something similar a decade earlier, but failed to describe his apparatus until 1861.

Whenever it was invented, once the idea was published it was quick to take off amongst practitioners and patients alike. Already by the 1880s a US and a British manual of hypodermic medication had been published. By then, the hypodermic method was spreading rapidly, championed by its advocates as a technological miracle with awe-inspiring potential for curing all manner of ailments. It was the demand for the hypodermic form of morphine, ironically introduced early on to prevent addiction to opiates, that became an unstoppable passion, especially amongst the wealthy. Narcotics were relatively easy to procure, and the syringe became increasingly available over the counter. The consequent casual use of morphine become popular and worrisome enough for its addictive use to be classified as a disease: 'morphinism'.

Little more than a century ago, the hypodermic syringe was virtually absent from the medical arsenal; but since then it has become one of the most commonly used pieces of medical equipment. Historians of anaesthesia often cite C L Schleich (1859–1922) as the originator of the idea of using hypodermic syringes to administer local anaesthetic drugs into tissues. Their use by physicians and particularly dentists has now become virtually ubiquitous. Hypodermic syringes have been at the centre of a number of other medical

breakthroughs: in blood transfusion, in the use of insulin and antibiotics, in the evolution of drugs and sera such as penicillin, and in worldwide mass immunization campaigns. In 1974 less than 5 per cent of the world's children had been immunized against killer diseases; by 1990 the figure had risen to 80 per cent. Any number of special needles have also been developed for spinal work, in intravenous therapy, for biopsies, for heart work and a wide range of others for use in veterinary medicine.

The appetite in the 1960s and 1970s for sensual pleasures and social experimentation brought with it a new wave of intravenous drug use, especially with heroin. In its wake, the syringe became something of an icon, virtually worshipped by some drug-users, but abhorred by much of the rest of society. The discovery that needles were also one means by which AIDS was transmitted brought with it a new horror associated with the needle. To add to the public's unease, a recent *Nature* article associates the spread of AIDS with the mass smallpox immunization campaigns in Africa organized by the WHO. While the introduction of cheap one-use plastic hypodermics did something to rescue the image of the hypodermic, the bubble of its public profile had burst. The needle that had promised both to ease human pain and rid the world of diseases, now seemed destined to spread both a particularly virulent virus-borne disease (AIDS) and another that some saw as a 'social cancer' (drug addiction).

The medical needle's reputation has then risen only to fall; but throughout the history of its image, it has occupied an unrivalled role in the iconography of medicine, and a perceptible place amongst the common visual embodiments of such broad ideas as pain and danger, pleasure and sensuality. The culture of needles then is wide and deep, and a range of artists have drawn on its potency. The work of HIV-positive performance artist Ron Athey, for example, includes the audience participating in pushing a crown of thorns made of needles into his scalp, while Mark-Anthony Turnage's recently premiered instrumental work *Blood on the Floor* includes one movement simply entitled 'Needles'. And a recent film *Conspiracy Theory* includes a sinister character who wields a syringe of truth serum.

The one potential threat for the cultural position occupied by the medical needle has come not from political or social activists, but rather from medical technologists, who are busily investigating various methods of drug and vaccine delivery that deliberately avoid the use of needles. It is their nasal spray vaccines, ultrasonic needleless injection equipment, skin patches, and dissolvable 'gum patches', that in making medical needles a less ubiquitous piece of medical equipment, might well knock needles off their iconic pedestal.

4.1 (a) Enema syringe in plastic. Late nineteenth century. [Illustrated] (b) Large enema syringe in ivory. French. Eighteenth century. [Illustrated] (c) Enema syringe in brass made by Arnold and Sons. England. Late nineteenth century. [Illustrated] (d) A 'modern' physician compares the size of his syringe with an old physician's clyster. Photomechanical reproduction of a lithograph by Jules-Abel Faivre. 1902

The cartoon appears in an issue of *L'Assiette au Beurre* devoted to 'Les médecins'. The man holding the syringe comments that his instrument is not for "the same side [of the body]". The syringe has only relatively recently been used in association with a hollow needle to deliver anaesthetics, drugs and vaccines, and to extract blood. Before the advent of hypodermics in the mid-nineteenth century, the medical employment of syringes was most commonly to apply an enema – the introduction of a liquid into the rectum.

(a) loaned by the Science Museum – A606171; (b) A606599; (c) A626202; (d) Iconographic Collections – cat. no. 17071

4.2 (a) Intradermal Calipers and Syringes... Arnold & Sons catalogue. 1938. (b) Fritz Freienstein, *Improvements Connected with Injection Syringes and the Like*. London, 1896. (c) Piston-action syringe in glass and vulcanite. Late nineteenth century? (d) Range of modern plastic hypodermic syringes

Freienstein's patented innovations for 'injection syringes' related to the mechanism by which the needle of a hypodermic was attached to the cylinder. The Arnold & Sons catalogue indicates that a 20-cc serum syringe cost £1:13s in 1938. Today, syringes tend to be made of plastic, while the needles are mostly disposable, being thrown away after a single use.

Modern Medicine collections – (a) V:WO162 1938 A75i; (b) patents (unbound) 1896.12677; loaned by the Science Museum – (c) A629124; (d) supplied by Sherwood Davis & Geck

4.3 Sir George Buckston Browne's walking stick. Nineteenth century

To all appearances a relatively ordinary silver-topped walking stick, upon opening, both the handle and the stick become a doctor's Lilliputian arsenal. The handle holds a tiny hypodermic syringe in a silver case, drug capsules and a lancet with tortoiseshell handle, whilst the shaft of the cane holds assorted phials. Although undoubtedly a novelty item, other early medical walking sticks are known to have housed a nurse's pulse timer, a doctor's pomander and a midwife's baby scale. Non-medical novelty canes were made to disguise pen and ink, maps, liquor flasks, watches, swords, daggers and opium pipes.

loaned by The Royal College of Surgeons of England

4.4 (a) Girl giving herself injection of insulin. Reproduction of photograph. 1990s. (b) Range of leaflets and promotional material for the British Diabetics Association, including a model taxi. (c) B-D Pen for daily insulin injections. Made in USA. 1997. (d) Blood sample testing kit

About 300 000 people in the UK suffer from type 1 diabetes, which means that they have to live with daily injections, to replace the insulin that the pancreas is not producing. Artificial insulin tends to be injected by three devices: a standard disposable plastic syringe, a pen injector and a jet injector. Different methods of application seem to suit different patients. Artificial insulin is either made from the pancreas of cows and pigs or from certain types of bacteria that produce a 'human' insulin. Recent biotechnological advances have suggested that it might be possible to develop an insulin delivery system based on inhaling a fine powder or spray. Another needleless insulin delivery system being investigated in the USA involves an implantable pump which delivers a steady stream of insulin directly to the liver.

(a) Wellcome Trust Medical Photographic Library – ICDI – NT acq. no. 8871; (c) supplied by Becton Dickinson; (d) loaned by the Science Museum

4.5 (a) 'If he should fall, is your blood there to save him?' Army Blood Transfusion Service poster by Abram Games. 1951(?) (b) Leech jar in glass. France. Late nineteenth century. (c) Blood transfusion set by Baxter USA. 1938

Though blood letting was a long-standing medical practice used to treat any number of complaints, and though experimentation with blood transfusion had begun in the seventeenth century, James Blundell challenged many fast-held assumptions in 1818, when he suggested that blood be transfused into haemorrhaging women. The practice was re-introduced into the UK medical world during the First World War, when desperation encouraged practitioners to practise transfusion at the Front. The poster comes from a collection of papers relating to the Blood Transfusion Service, a body engaged in the organization and development of the blood transfusion services necessary as part of the Second World War effort. The Baxter machine is one of a series donated to the Science Museum through Drs Jenkins and Harrison by the Brentwood Blood Transfusion Service.

(a) CMAC – GC/107/1; loaned by the Science Museum – (b) A73610; (c) Jenkins 10

4.6 (a) Dr Elsie M Widdowson's self-experimentation. Reproduction of a photograph. 1937(?). [Illustrated] (b) Hypodermic syringe of glass in nickel-plated brass case. England, 1910s

The photograph shows Dr Widdowson's experiment in which she injected iron, calcium and magnesium into her own arm during a half-hour in order to study the absorption and excretion of iron in the body. The original equipment and a replica arm were exhibited by

the Royal Society in 1996 and are now kept in the Dunn Nutritional Laboratory in Cambridge. Elsie Widdowson was a plant physiologist who at Imperial College, London, was one of just three women scientists in her year. In collaboration with the biochemist Robert McCance she produced the 'bible' of nutritionists, *The Chemical Composition of Foods*, in which they meticulously analysed foods for sugars, starch, protein, minerals and fibre. In addition to the tables, the work also contained recipes, many of them taken from the Widdowson family cookbook. During the war they worked on establishing how to make the most nutritionally out of home-produced food. Their findings helped shape wartime rationing. They also did experiments to determine calcium absorption in bread.

(a) CMAC – GC/97/B2; (b) loaned by the Science Museum – A7787

4.7 (a) Preserved sample of tattooed skin showing a male bust and flower stem. France late nineteenth century. (b) Electric tattooing machine and needle. 1990s. (c) 'Tattoo Inkorporated Presents: The biggest tattoo and bodyarts party ever' flier. 1992. (d) Chris Wobleski, *Classic Skin Shows*. New York, 1995. (e) 'AIDS: Guidelines for tattooists' government information leaflet. 1987

The term tattoo was coined in the eighteenth century from the Tahitian word tatau. The technique involves applying a picture or design to the skin by pricking it with a needle thereby staining it with indelible inks. As the government information leaflet makes clear, the advent of AIDS brought with it worries about the safety of tattooing. The risks of getting the AIDS virus from tattooing are extremely remote. The leaflet recommends using fresh colours for each customer, using disposable equipment and sterilizing other equipment.

(a) loaned by the Science Museum – A680; (b) loaned by Into You; (c) Modern Medicine Collection

4.8 Sivanatha Khanna, *Sacitra Injeksana*. Varanasi, 1973

This is a Hindi work on injection therapy. The injection syringe is part of cosmopolitan world medicine, but in some social strata in India it has acquired a meaning which does not completely match its original purpose. The injection is experienced by many people in poorer or less educated social groups as having a specific power or virtue that is quite distinct from the effect of the medicinal fluid delivered. People may approach unorthodox medical therapists for injections to cure, for example, headaches. In such cases, the 'physician' may inject only water, but the patient nevertheless feels the benefit of having received a painful, invasive, modern, and therefore undoubtedly powerful treatment. 'Injection therapy' has thus become a minor branch of treatment quite distinct from its origins in cosmopolitan medicine.

Oriental Collections

4.9 (a) Aleister Crowley, *The Diary of a Drug Fiend*. London, 1922 (b) 'The crazy war on drugs'. *New Internationalist*, October 1991. (b) 'Danger – Drugs at Work'. CBI brochure. 1986. (c) 'Drugs and Drug Addiction in Europe'. European Parliament leaflet. 1992

Public perception of narcotics has changed from what had been an acceptance of both medicinal and non-medicinal use prior to the twentieth century, to what has now become a global illegal drug crackdown. Although opiate use was often linked with the immorality of gambling and smoking in the nineteenth century, the avoidance of narcotics laws and concomitant moral censure meant that the rise of the deviant addict subculture was yet to come. *The Diary of a Drug Fiend* was one such manifestation of the rise of the deviant addict. By the time of Crowley's death in 1939 aged 64, his vilification as the 'worst man in the world' was no doubt partly due to his predilection for massive amounts of drugs. Though a number of drugs are taken intravenously, that most commonly associated with hypodermic needles is heroin. Though addiction, overdoses and impurities are all dangers associated with drugs, the onset of AIDS has made infections carried by needles one of the greatest threats to intravenous drug users. The realization of this fact resulted in a number of campaigns to distribute disposable syringes and set up needle-exchange programmes. Research has shown that failure to implement such exchange programmes widely in the USA early in the course of the AIDS epidemic may have led to 10 000 preventable HIV infections among injection drug users, their sexual partners and their children.

(a) Historical Collections – FCEAA9; Modern Medicine Collection – (c) WM270 1986C74d; (d) WM270 1992 E91d

4.10 (a) **Prospectus and non-working Dermal PowderJect – needleless injection equipment. 1997.** (b) **Photograph of Inhaler device (awaiting patent approval) which could be used instead of injections. California, USA, 1997**

Launched in 1997, the Dermal PowderJect is a novel drug delivery technology allowing needleless injection of drugs in powder form. It works by using helium to accelerate fine particles of drug through the skin at twice the speed of sound. Users will hear a tiny sonic boom. The manufacturers anticipate that it will be used both for drug delivery and the evolving demand for gene delivery. The Inhaler device is another means by which patients might be able to ingest their medicines without resorting to the ever feared hypodermic. It might for example be used for delivering medical products like insulin for diabetics, thus removing the need for daily injections. Drugs such as tobacco, marijuana and opium, as well as legal compounds used by asthmatics have long been inhaled. Other alternatives to the painful, or at least fearful, needle-based drug delivery systems being explored are nasal sprays, skin patches, and dissolvable 'gum patches'.

(a) supplied by PowderJect Pharmaceuticals plc; (b) supplied by Inhale Therapeutic Systems, USA

4.11 An allegory of the sense of touch. Engraving, possibly by George Glover. c. 1625. [Illustrated]

A common subject in Dutch prints of the early seventeenth century was the depiction of beautifully clothed women in an allegory of vanity or *memento mori*. This image addresses the viewer with a moral lesson. The woman's finger bleeds from being pecked by a parrot representing worldly sin. A spider and his web in the window symbolize dangers and snares, whilst the snail moving up the wall exemplifies perseverance and the chance to overcome sin. Originating probably from a Dutch print, the engraver has added an inscription in English which reads:

"When hearing, seeing, tasting, smelling's past: Feeling (as long as life remains) doth last. Mayde reach my lute, I am not well indeede: O pitty-mee, my bird hath made me bleed."

Implicit too is the idea that the sense of touch persists longer (in pain) than the other senses.

Iconographic Collections – cat. no. 27049

4.12 (a) A surgeon holding a dental key behind his back to conceal it from the patient. Painting on canvas by Luciano Nezzo (b. 1856). [Illustrated] (b) Dental anaesthetic syringe with case. Germany, 1910s. (c) Anaesthetic needle from a patient's viewpoint. Reproduction of photograph. 1990s. [Illustrated]

Fear of pain inflicted by medical practitioners is a long-standing theme in images concerned with medicine. The concealment of surgical instruments was a common one in old surgical texts. The modern photograph depicts a 'patient's eye' view of the hypodermic needle prior to injection, and for many will similarly conjure up memories of uncomfortable nervous moments waiting for the injection of an anaesthetic.

(a) Iconographic Collections – icv 17502; (b) loaned by the Science Museum – 619544 (c) Wellcome Trust

Medical Photographic Library – no. 13256 A/I

4.13 (a) A doctor carrying a giant syringe. Pen drawing. Eighteenth century (b) 'The village doctor besieged'. Watercolour. England. Eighteenth century. [Illustrated]

In the watercolour, an angry mob of villagers is shown protesting outside the house of a doctor, who responds by squirting a syringe at them. The syringe often appears in images related to, or drawing from, the world of medicine. From the seventeenth century on it frequently appears as a 'tool of the trade' – almost as a badge of identity. And in satirical images, the syringe is often shown as a weapon that medics can turn to either for malevolent ends or to defend themselves against angry patients and the like.

Iconographic Collections - cat. nos (a) 10954; (b) 10978

4.14 (a) 'Le vaccin'. Photomechanical reproduction of a lithograph by Rousset after J-A Faivre. c. 1890. (b) Two postcards with comic scenes of injections. Twentieth century. (c) 'Windy moments – No.1 Being inoculated'. Drawing by Fred May. [Illustrated]

The perceived sexual and erotic overtones of injecting were not lost on generation after generation of visual humorists. The lecherous doctor gazes at the tightly corseted bosom of his young patient as he prepares to inject her arm, and comments that he can see two injections that have already 'taken well'. The postcards carry the captions: surgeon to nurse (while patient is howling in agony): "How b----- stupid can you get, I distinctly said – Prick his boil!" and doctor to naked female patient: "Now just relax Miss Smith – you will only feel a tiny prick!" The common allies of pain and laughter have also encouraged a rich tradition of comedy revolving about the fear of vaccination, one particularly associated with military service.

Iconographic Collections – (a) cat. no. 17166; (b) accession no. 349716; (c) cat. no. 24072

4.15 (a) Fiona Sinclair, *Dead or a Physician* and James Byrom, *Take Only as Directed* – reproductions of 1950s and 60s mystery novels. (b) 'Killing with kindness'. Euthanasia article in *New Statesman*, 15 August 1997

So-called 'lethal injections' have been used in a range of what might be termed 'programmed' deaths. Since the late nineteenth century, they have been used as a way of administering poisons to murder victims, and have featured, as these crime novel covers indicate, in any number of fictional accounts of such crimes. A recent factual case heard before the Court of Appeal involved a defendant who claimed that he had signed a blank confession form only after terrorization by an officer wielding a hypodermic syringe. In an 'official' context they are also used for execution purposes throughout the world. A recent report from Amnesty International challenges claims that death by lethal injection is quick and painless. The report surveys deaths by lethal injection in the US prison service since its introduction in 1977, and records more than 24 'botched' executions resulting in considerable and sometimes prolonged pain for executed prisoners. Finally, in a more benign fashion, the hypodermic syringe is also commonly used in cases of euthanasia and doctor-assisted deaths.

4.16 (a) Ballpoint pens in the form of syringes. 1997. (b) Franko B, 'Homes and Garden'. Barrett-Forster art'g', 'insertion'. Postcards of artwork employing imagery of intravenous tubes and hypodermic needles. 1995

From their first employment to medical ends in the mid-nineteenth century, hypodermic needles have found ever increasing numbers of medical uses in which fluids are either injected into or extracted from patients. The pain and fear associated with these operations

has, as these two examples indicate, meant that the medical needle has become a very prominent visual symbol in our culture.

4.17 'Rest in pieces'. Work in mixed media by Aidan Shingler. 1998. [Detail illustrated]

This work addresses the violation of the artist's human rights when he "was held down and forcibly injected with neuroleptic drugs". A white cross with hand and foot prints and a crown of white flowers at the corresponding points of a body, the work's meaning is emphasized by hypodermic syringes impaling the hands and feet. The artist uses the term 'schizophrenic' in reference to his work, but as an expediency for a condition he believes is more accurately defined as 'spiritual conflict'. Critics of psychiatry's aim to fit 'difficult' individuals into society point to the frequent conflicts between these aims and the basic principle of setting limits to how much social authority should be exerted on an individual.

loaned by the artist

Section 5

Acupuncture: Needle therapy

The Far Eastern practice of acupuncture has its origins in Stone-Age China. It was not, however, until the period from the fourth to the tenth centuries that it evolved as a medical specialization, with many of the classic texts appearing in which acupuncture was first systematized and in which the nature, location and number of each of the channels and acupoints were laid out.

The tradition of acupuncture, as with other Chinese medical practices, has not followed the Western pattern of continual evolution punctuated by episodes of intellectual revolution when one set of ideas replaced another. Instead acupuncture has been treated to ever more detailed explorations of a basic idea that has remained remarkably unchanged for centuries. Within that, however, innovations have been introduced, for example in the methods of inserting, directing, rotating and withdrawing the needles, and much more recently, in the introduction of electro-acupuncture.

The needles used in acupuncture therapy are inserted into the skin at a number of precise points. There are 26 series of points that follow given lines or 'meridians' over the body's surface, each allowing the treatment of a specific visceral organ by remote control: one for the heart, another for the lungs, and so on. To insert acupuncture needles, the practitioner commonly taps the end of with his or her finger, or with some small implement. The theory behind acupuncture fits within the overall concept of energy known as the *Ch'i*, or life force, and is based on the notion of a balance between the dual flows of energy called Yin and Yang. Acupuncture is used to stimulate the circulation of this 'vital energy' along the so-called 'meridians'.

In China and Japan, the introduction of Western medicine from the seventeenth century led to a gradual diminution of the strength of traditional practices such as acupuncture. By 1822, the Emperor Dao Guang decreed that acupuncture and moxibustion (the treatment of disease by application of burning mugwort leaves) were not suitable forms of treatment for a monarch. During this period of decline, acupuncture and other forms of traditional Chinese medicine came to be looked down on as at best quaint and colourful. It was only during the political uprisings of the 'Great Leap Forward' and the 'Cultural Revolution', when all things Chinese were heavily promoted, were they revitalized.

The reception of acupuncture in Europe was slow, but by the mid-nineteenth century there was a flourishing literature on the subject in Paris. The last three decades, however, have seen a huge change in attitude amongst the Anglo-Saxon public and medical professions alike. Part of the shift in thinking was captured earlier in the century by Aldous Huxley's comments: "That a needle stuck into the skin of the foot should help a case of migraine is

obviously incredible; it makes no sense. [And yet,] as a matter of empirical fact, it does happen." Explanations of exactly how it works, which satisfy the whole of the scientific community, are still awaited, but, fuelled in part by a dissatisfaction with conventional medicine, the popularity of acupuncture has recently greatly risen in the USA and UK. It has, for example, been suggested that Americans spend some \$500 million on acupuncture annually.

At the beginning of the 1990s it was estimated that half-a-million Chinese doctors practised acupuncture, 30 000 in Japan and another quarter of a million in the rest of the Far East. In a number of European countries it can now be obtained under National Health Service schemes. Part of the international appeal of acupuncture lies in the fact that it is cheap, technologically simple and relatively safe. It also seems to be fairly effective for a selection of common, troublesome conditions such as chronic pains, musculoskeletal disorders, and a variety of stress-induced conditions, which conventional medicine finds particularly difficult to deal with.

Exhibits

5.1 (a) Yang Chi-chou, *Tseng-pu hui-t'u Chen-chiu ta-ch'eng*. 1908. (b) Medical manuscript without title relating to receipts on acupuncture. China. Early eighteenth century

This is a 1908 edition of the handbook of acupuncture by Yang Chi-chou (1522–1620). The illustration names a series of acupoints on the body's surface. The early eighteenth-century manuscript contains prescriptions for various diseases and a section on manipulation and massage. The illustrations of the human body shown indicate the acupuncture marks. The systematic analysis of the ancient Eastern art of acupuncture began to evolve in the third century AD, with the next 500 years seeing it evolve as a highly developed medical specialization. A number of acupuncture works were written in verse, which made them easy to memorize.

Oriental Collections – (a) Chinese no. 68ii; (b) Chinese no. 71

5.2 (a) A patient being treated with an acupuncture needle in the leg. Watercolour. Korea(?) Eighteenth century(?). (b) Hands undergoing acupuncture therapy. Reproduction of photograph. Britain. 1982

The practice of acupuncture may well go back to the stone age. Its subsequent development has led both to the evolution of a theoretical context for the practice and the refinement of various aspects of the practice such as the methods of insertion, direction, depth and speed,

as well as ways of retaining or withdrawing the needles. The watercolour drawing shows a patient with a foot problem being treated with acupuncture. The use of low voltage electricity with acupuncture needles is a fairly recent innovation.

Iconographic Collections – (a) icv 18865; (b) Wellcome Trust Medical Photographic Library – acq. no. 8804

5.3 The foot chao yan channel for the kidney with 54 points. An acupuncture chart showing a seated figure. Watercolour. Eighteenth century(?)

The picture of the seated man shows the shen, or kidney meridian, and its acupuncture points. Work on systematizing acupuncture, and in particular of naming and numbering the points of each channel and their exact locations, was carried out by successive generations of Chinese physician-acupuncturists' families, particularly those who were the attendants of emperors, from the fourth to the tenth centuries.

Iconographic Collections – icv18878

5.4 Yoshida Ikiu, *Justrikeiryaku rozu*. Manuscript scroll and box. Japan. 1688

This is a makemono scroll by Yoshida Ikiu, which was in the possession of the Yoshida family until 1910. It is heavily illustrated with coloured images of the internal organs of the human body and diagrams of moxa and acupuncture points. Since the sixth century AD, Japanese students were sent to China to study medicine that included acupuncture. In the mid-nineteenth century, cultural reforms in Japan brought with them a partial rejection of traditional Chinese medicine, including acupuncture, in favour of Western practices.

Oriental Collections – Japanese MS 34

5.5 'The Newest Illustrations of Acupuncture Points'. 'Acupoints' and 'The Meridians' ('Revised and enlarged edition'). A selection of new acupuncture charts. Hong Kong. 1996

The Medicine & Health Publishing Company also produces a number of other publications that testify to acupuncture's widespread application in China: *The Principles and Practical Use of Acupuncture Anaesthesia*, *Practical Ear-needling Therapy*, *The Manual of China's Current Acupuncture Therapy*, *Scalp-needling Therapy*, *'Plum Blossom' Needle Therapy*, and *The Treatment of 100 Common Diseases by New Acupuncture*.

5.6 (a) Acupuncture figure. Bronze. China. Seventeenth century. (b) Models of a human foot, ear and whole body showing Chinese acupuncture points and the courses of meridians in plastic. Made in China. 1997

The bronze figure is unusual in having one foot raised as if dancing, which may be an attempt to depict a contracture. If this is the case, then the one series of acupuncture points shown on the model may be those used for treating this condition. The plastic models are

used both for teaching and practising purposes. They were manufactured by Shanghai Specimens & Models Factory and bought in London in 1997. Life-sized models are often used for teaching purposes. Traditionally, models with the points and channels carved onto the surface would be coated with wax to test students. Sometimes the models were hollow and filled with water or mercury. A student would be asked to find a particular point, which, if correctly identified with a needle, would then produce a visible leak.

(a) loaned by the Science Museum – A135061

5.7 (a) Yang Chi-chou, *Chen-chiu ta-ch'eng*. (b) Acupuncture needles in a silk case. Japan. Nineteenth century. (c) Acupuncture needles in a wooden case. Late nineteenth century. (d) Reproductions of acupuncture needles of the Han Dynasty. (e) Range of modern acupuncture needles. Bought in London 1997

First published in 1601, Yang Chi-chou's work is a compendium of acupuncture and moxibustion. The opening shows a selection of the traditional nine kinds of needles used in acupuncture. The original four gold and two silver needles of the Han period were unearthed in Liu Sheng's tomb at Mancheng, Hebei in China in 1968. Liu reigned as king of the Shong Shan region from 154–113 BC. These replicas were made by the Museum of Chinese Medical History. The use of stone acupuncture needles (Bian Shi) is reported in several ancient Chinese manuscripts, but modern needles have mainly been made from steel, copper or silver. An acupuncture needle is far finer than the average syringe needle. Different lengths of needle are used for different acupoints on the body. Some very long ones are occasionally used to allow access to the intestines. They may be in position for a short or long period, with some small ones being left in the body for several days. Needles may be used hot or cold, the heat being produced by some burning moxa tied to the end of the needle.

(a) Oriental Collections – Chinese no. 68i; loaned by the Science Museum – (b) A624286; (c) A624244;

(d and e) loaned by Kan-Wen Ma

5.8 (a) Willem ten Rhijne, *Dissertatio de Arthritide Mantissa Schematica de Acupunctura*. London, 1683. (b) James Churchill, *A Treatise on Acupuncturation*. London, 1821

A graduate of Angers University, The Netherlands, Willem ten Rhijne (1649–1700) was the first Western-trained physician to describe Japanese medicine in detail. His *Dissertatio de Arthritide* refers to Japanese and Chinese medical practice and is followed by an appendix on acupuncture. It was the influence of this and other early works on medicine practised in Japan rather than China that first exposed Europeans to the practice of acupuncture. The sites indicated on the figure shown are those used for applying acupuncture and moxa (the treatment of disease by application of burning mugwort

leaves). The yang meridians are also shown. The full title of Churchill's work described how acupuncture was "originally peculiar to the Japonese [sic] and Chinese...now introduced into European practice". Apart from France, however, where acupuncture was employed by leading French physicians from the early decades of the nineteenth century, the rest of Europe took little interest in the practice until more recent times.

EPB – (a) 43818/B/1(b) 17818/A

5.9 'Bliss! Distressed? Depressed? Get De-stressed! From hot needles to cool spas...' *Time Out*, 12–19 November 1997

"The pampering business is booming," reads the copy in this magazine, "here's where to treat yourself without breaking the bank." Acupuncture, it says, "is ideal for emotional problems like stress or grief, and physical conditions such as arthritis, high blood pressure and even labour pain." Like many 'complementary therapies', acupuncture has come to be resorted to both for specific but also more general and vague complaints. French researchers, for example, have found that acupuncture speeds the sobering process after a bout of drinking. However, some acupuncturists still complain that they are approached as a 'treatment of last resort'.

5.10 'Guidelines for Acupuncturists'. Government information leaflet on AIDS. 1987

The leaflet was produced as one in a series under the general title of 'Don't Die of Ignorance'. Like a similar leaflet for tattooists, it points out that "no one has ever been known to catch the AIDS virus from acupuncture," but also recommends that pre-sterilized disposable needles should be used whenever possible. The advent of AIDS has enormously accelerated the shift from the traditional re-use of needles to the employment of sterile disposable equipment, which is thrown away after a single use.

Modern Medicine Collections

The art of mending a wound with a bone needle and a cord of either natural fibre or animal tissue is pre-historic. The credit for the invention of suturing needles is often given to the Central Asian people known as the Solutres, who, some 13 000 years before the Christian era, developed the stone tools that enabled them to fashion bone suturing needles. In 4000 BC, the Egyptians appear to have been performing not only skin but also abdominal operations with this type of needle.

Gold, silver and bronze alloys were the first metals used for suture needles, there being no definite mention of iron until the first century AD. Some 700 years later Haly Abbas described the innovation of using a triangular pointed needle, which had an increased ability to cut and pierce the skin. The use of animal tissue for sutures, specifically catgut, is thought to have evolved from its use in musical instruments. The tenth-century Arabic medical writer Rhazes described the stitching of wounds with a thread made from sheep intestines.

Until about a century ago, however, the likelihood of a patient surviving a serious operation was so low as to discourage any but the most desperate forms of surgery. Many eighteenth- and nineteenth-century surgeons favoured tight bandaging or adhesive strapping over suturing as a way of healing wounds. It was particularly the work of Joseph Lister, who in the second half of the nineteenth century demonstrated the value of germ theory to surgery and thereby formulated a new surgical methodology, that gave surgical practitioners a new-found confidence to do more operations. In the wake of these innovations much more elaborate and refined suturing techniques were experimented with, as were all manner of different materials for suturing: gold, silver, iron, silk, linen, cotton, animal tendons from beasts as diverse as rats, racoons, kangaroos and whales, and chemically or mechanically treated guts.

For much of the history of suturing, little distinction, at least amongst manufacturers, has been made between surgical and other needles. During the Napoleonic wars British doctors still equipped themselves with sail makers' or glovers' needles, used because they carried the desired triangular cutting point. Accompanying the great developments in nineteenth century surgery, however, needles manufacturers in England (mostly based in Redditch) began to divide their trade between those who made surgical needles and those who did not. Any number of technical and material innovations has been launched since then, as have a host of specialist needles used in ever more audacious operations to remove and replace entire limbs and organs. As a consequence, today's surgical needle maker can carry a range of thousands of needles, with a dizzying variety of material, length, curvature and thickness, not to mention more than half a dozen eye-types.

6.1 'Miscellanea Medica XVIII'. Manuscript collection of medical treatises in Latin. France. Early fourteenth century. [Illustrated]

One of the small marginal sketches on the page shown is of a standing figure suturing another man's scalp. Scalp surgery today employs a particularly imposing range of needles, mostly made with a spring eye to facilitate threading. Evidence suggests that wound-suturing with bone needles was practised in the Stone Age. Evidence exists for the manufacture of suture needles as long ago as 13 000 years before the Christian era, with periodic developments of the equipment taking place in Egyptian, Ancient Islamic, Greek and Roman civilizations. Further innovations took place in the Middle Ages, with a French surgeon Henri de Mondeville making the first grooved eye in a suture needle, thus reducing the combined width of needle and suture. Further innovations only really followed the increased success rate of operations brought about by new thinking in the nineteenth century.

WMS – 544

6.2 Lorenz Heister, *Chirurgie, in welcher alles, was zur Wund-Artzney gehört... abgehandelt...werden*. Nuremberg, 1743

This work by the German physician Lorenz Heister (1683–1758) was reprinted some 21 times and translated into six languages. According to Heister, the necessary apparatus for dressing wounds was incomplete without ligature cords and strings, which were to be of different sorts, made variously from cloth, flax, silk, or horsehair used according to the nature of the disorder. The illustration shows a range of surgical instruments and a face undergoing an operation on the lip. While the effects of hair lips on hearing, speech and maxillary growth are well understood and their correction through surgery is relatively successful, the effect on facial appearance is far less well understood. Recently however, a surgeon (Anthony Rowsell) and an artist (Stephen Farthing) have worked in partnership to improve this aspect of cleft palate surgery.

EPB – 28191/B

6.3 Alexandre Colson, *Memoire sur le Traitement des Plaies Sucedanta l'Extirpation des Tumeurs du Sein et de l'Aisselle. Au moyen de la suture entortille*. Paris, 1845

The illustration shows a woman after she has been successfully operated for a mastectomy. The novelist Fanny Burney's *Diary and Letters...* records a vivid account of her mastectomy for breast cancer in 1811 (without anaesthesia), the third known early record of a mastectomy. With a cambric handkerchief over her face, "I saw, through it, that the bedstead was instantly surrounded by the seven men and my nurse; but when bright through the cambric,

I saw the glitter of polished steel, I closed my eyes". In a mastectomy an incision from two to five inches long is made in the area of the tumour. The mammary gland is removed, as well as the nipple and the areola, leaving an outer layer of skin to cover the space where the breast had been. Fanny Burney's wound healed without infection, and she lived for many more years.

EPB – 18439/B

6.4 (a) James La Forest King, *Improvements in Suture-needle and Case*. London, 1888. (b) Set of Gagedorn's suture needles in steel. England. 1880–1920

The specialization of some needle manufacturers in needles specifically for suturing did not happen to any great extent until the nineteenth century. Wellington's army surgeons at the Battle of Waterloo were, for example, still making do with ordinary needles. But much technical innovation followed in the next century. James La Forest King was a US inventor, whose patent application was for a suture-needle-handle carrier. One of the innovations of his gadget was the provision of a number of bobbins within the case so that different sizes and indeed materials of thread (silk, animal ligatures or wire) could be "quickly changed when necessary during an operation".

(a) Modern Medicine Collections – patents (unbound); (b) loaned by the Science Museum – A270171

6.5 (a) Sample of Sulpho-Chromic Catgut thread for suturing produced by Matthews Brothers. London. (b) Suture needles and thread made by M Milward and Sons. England. Nineteenth century. (c) Microvascular needle compared with a human hair. Reproduction of photograph. 1990s. (d) Two sizes of suturing needles supplied by Sterifeal. 1998

The Matthews Brothers were surgical instrument makers to King's College Hospital, London. This catgut suture was "prepared to the formula of Lord Lister". The Milward samples carry an inscription which indicates that they were associated with the surgeon Joseph Lister (1827–1912), who most famously introduced the use of antiseptics into surgery. He is also credited with re-introducing catgut into surgery, and more particularly with the notion that it was not the ligatures and sutures themselves but the bacteria in them that caused wounds to become infected after operations.

(a) WMS – 6975/item 6; (b) loaned by the Science Museum – A600322; (c) Wellcome Trust Medical Photographic Library – acq. no. 7769; (d) supplied by Sterifeal

6.6 (a) 'Rules for the reunion of deep muscular wounds'. Four diagrams illustrating heads with severe wounds, demonstrating how to stitch the skin back together properly. Stipple engraving by John Bell. [Illustrated] (b) Diagram illustrating various surgical stitches and the tying up of surgical thread. Coloured pencil drawing. (c) Medical instructor teaching suturing. Reproduction of photograph. 1990s

The Edinburgh physician John Bell was a proponent of surgical anatomy, who in 1790 set up his own theatre to give lectures on practical surgery, anatomy and midwifery. Competition with the University led to numerous battles with its teachers. He also wrote numerous works on anatomy and surgery, the illustrations for which he also took charge of. His own skills as a surgeon were widely acclaimed. It was Joseph Lister's understanding of why operations so frequently became infected and his innovative ideas of how to prevent them doing so that allowed the extraordinary development of surgery in the nineteenth century and the evolution of suturing needles that accompanied it. In 1889 Lister came to Redditch (the needle-making town) to have made to his own specifications the first full range of surgeon's needles. Many aspects of the surgeon's needle were subsequently examined and experimented with.

Iconographic Collections – (a) cat. no. 23317; (b) cat. no. 23156; (c) Wellcome Trust Medical
Photographic Library – 17128

6.7 P I Androsov, *Surgical Suturing Instruments and their Clinical Uses*. Moscow, 196-?

The diagram at the opening shown is of the transplantation of a puppy's head to the neck of an adult dog according to V P Demikhov. As this work's introduction indicates, vast improvements in the success rates of a variety of surgical operations were made in the first half of the this century. Prior to 1914, for example, the death rate for operations for perforated gastric ulcers was around 60 per cent; by the 1960s this had fallen to 4 per cent. Much of the improvement was realized through the development of ever more sophisticated medical technology (including suturing techniques), which led surgeons to attempt ever more audacious, some would say needlessly sensational, operations, such as the one illustrated here.

Modern Medicine Collections – XWO

6.8 'Heart Bypass' no. 15. Acrylic painting by Erika Itta. Germany, 1997

This is one of a series of 18 paintings depicting a life-saving triple aorto-coronary bypass operation. In the image a bypass is being sewn on to the peripheral section of the artery. The series was done after the artist listened to the story of a grateful patient who survived the operation. A number of the other images in the series also feature the black jackal's head of the god Anubis, who in ancient Egyptian myths weighed human hearts, prepared the dead for embalming and who was also renowned for treating his fellow gods and men with his healing hands and surgical insight.

loaned by the artist

6.9 Indermil Sterile Operating Theatre Kit and photograph of wound closure with Indermil. 1990s

For most of the history of medicine, the union and closure of human tissue has primarily been achieved using needle and thread or with other mechanical bindings, all using materials based primarily on natural products such as cotton, wood fibre, linen and animal sinews. More recently, Nylon and Dacron have gained in importance. For the last quarter of a century, surgeons have been interested in using adhesive bonds instead. A variety of advantages are advertised for this new method of wound closure (Indermil tissue adhesive) including greater speed, simplicity, precision and efficiency of use. The results are also potentially more aesthetically pleasing: less likely to result in the so-called 'zipper effect' – the form of scar left by conventional suturing.

supplied by Professor Alan Roberts

6.10 'It's much easier to cut out meat'. Poster produced by the Vegetarian Society. 1997

The poster draws on people's fear of the knives and needles of surgery by picturing three suture scars from colon, prostate and breast cancer operations. Along with contact details for the Vegetarian Society, the poster's text quotes official statistics for cancer as the cause of one in four UK deaths and further recent research suggesting that eating meat can increase the risk of cancer. However, the advertising campaign featuring the poster was heavily criticized by cancer charities, and, less surprisingly, the meat industry, and a significant number of individuals who complained to the Advertising Standards Authority. The campaign has since been withdrawn.

supplied by the Vegetarian Society

6.11 Suturing in process in the Surgery Department at Ninewells Hospital and Medical School, Dundee. Reproduction of photographs by Norman Matheson. 1997. [Illustrated]

The operation is an anastomosis after a sigmoid colectomy – that is the joining together of two ends of the large bowel after the removal of a tumour-bearing segment. The twentieth century has seen the evolution of an ever-growing series of needles for different purposes and different techniques, so that today several thousand needle types are manufactured for wound suturing. For regular surgery alone there are around 30 sizes, each of which can be fitted with ordinary, spring, Paterson, round, square or enlarged eyes, with virtually all being available in either carbon or stainless steel.

supplied by R J C Steele, Ninewells Hospital and Medical School, Dundee

Ken Arnold and Denna Jones

